(28,665)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1921.

No. 710.

BLUEFIELD WATER WORKS AND IMPROVEMENT COMPANY, PLAINTIFF IN ERROR,

vs.

PUBLIC SERVICE COMMISSION OF THE STATE OF WEST VIRGINIA ET AL.

IN ERROR TO THE SUPREME COURT OF APPEALS OF THE STATE OF WEST VIRGINIA.

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1 Pleas Before the Supreme Court of Appeals of the State of West Virginia.

At a Regular Term of the Supreme Court of Appeals, continued and held at Charleston, Kanawha County, on Friday, the 30th day of September, 1921, the following order was made and entered, to-wit:

4447.

BLUEFIELD WATER WORKS & IMPROVEMENT COMPANY, Petitioner,

vs.

PUBLIC SERVICE COMMISSION, Respondent.

This day came the Bluefield Water Works & Improvement Company, by Sanders, Crockett, Fox & Sanders, its attorneys, and tendered and filed its petition for suspension of an order of the Public Service Commission, made and entered on September 7, 1921, in a proceeding before said Commission in which said petitioner was complainant and the City of Bluefield was defendant, and, not desiring to ask for suspension of said order pending the final hearing, praying that the matters arising on said petition be set down for final hearing. Upon consideration whereof, said petition is ordered filed, and the Court doth fix Tuesday, the 1st day of November, 1921, for the final hearing on said petition, and doth order that a copy of this order be forthwith delivered to the Secretary of the Public Service Commission.

The petition aforesaid, and the papers, documents, evidence and records, or certified copies thereof, as certified to this office, are in the words and figures following:

2 In the Supreme Court of Appeals of West Virginia, Charleston.

BLUEFIELD WATER WORKS & IMPROVEMENT COMPANY, a Corporation, Petitioner,

vs.

CITY OF BLUEFIELD, a Municipal Corporation, Respondent.

In re Application of the Bluefield Water Works & Improvement Company Before the Public Service Commission of West Virginia for a Revaluation of its Plant and Authority to Increase Water Rates. Public Service Commission Case No. 1138.

Petition.

To the Honorable Judges of the Supreme Court of Appeals of West Virginia:

Your petitioner, Bluefield Water Works & Improvement Company, a corporation created and existing under and by virtue of the laws of West Virginia, would respectfully show that it is the applicant and petitioner in the above named cause, and that it is aggrieved by a final order entered in the above entitled cause by the Public Service Commission of West Virginia on the 7th day of September, 1921.

Petitioner would further show that on the 27th day of September, 1920, your petitioner filed its formal petition before the Pub-
3 lic Service Commission of West Virginia asking the Commission to review and set aside its findings in case No. 368 decided April 24, 1917, which fixed the value of petitioner's property used in the public service at $360,000.00, and also requesting such increase in water rates as would produce sufficient revenue to pay operating expenses and taxes, provide for depreciation and afford it a fair return upon the present fair value of its property now used and useful in the service of the public. The petition filed by the applicant alleges that its rates for supplying water to its consumers in the city of Bluefield, as fixed by the former orders of the Commission, are inadequate and insufficient to pay operating expenses and taxes, and the sum necessary to be set aside for depreciation and for return upon the fair value of the property used in the public service, and that the sum of $360,000.00 fixed as the value of the applicant's property by orders made in case No. 368 above mentioned was arbitrary and without evidence to support such finding, and that the sum is grossly less than the present fair value of its property and constituted in effect the taking of the property of the petitioner without due process of law, in violation of the Fourteenth Amendment of the Federal Constitution, and that since the entering of the said order there had been large and valuable additions, betterments and improvements made to the plant of the petitioner. The city of Blue-

field appeared and filed its answer and cross petition denying that the said sum of $360,000.00 as fixed by the Commission did not represent the true and actual value of the plant at the time of the making of the said order, and denying that there had been any additions or improvements made to the plant of the company, and alleging further that the plant and equipment of the said company was inadequate to supply the demands of the city, and praying that the Commission order the making of certain improvements and the adding of certain equipment to the plant of the company. Evidence was taken in support of both the application of petitioner and
4 the answer and cross petition of the respondent, and the case was submitted on the 11th day of July, 1921.

Petitioner would further show that in case No. 368 above referred to petitioner was directed to furnish an inventory of all its property, equipment, and etc. employed by it in the service of the public, and that petitioner in that case employed the services of John W. Alvord, an expert hydraulic and sanitary engineer, who, together with W. E. Miller, another expert employed by the city of Bluefield for the same purpose, proceeded to make, and did make, a complete inventory of petitioner's entire plant. This invoice was adopted by the Commission as correctly setting out the units composing the said plant at the time of the hearing of case No. 368. The applicant at the hearing of the present case No. 1138 filed a supplemental inventory showing the additions and improvements made to the plant of the applicant since the making of the previous inventory, and deducting from the said inventory such elements of the plant and equipment of the applicant as are no longer used and useful in the service of the public. At the direction of the Commission an inventory of the plant of the petitioner was made by W. Q. Gallaher, Chief Engineer of the Public Service Commission, who, after a survey of the plant, adopted the inventory as made by John W. Alvord and the supplemental inventory made by L. R. Howson as correctly setting out the plant used and useful in the service of the public as of January 1st, 1921.

Your petitioner would further show that at the hearing of the said case before the Public Service Commission the following valuations were placed upon the plant of the applicant company.

1. $1,194,363 based upon the reproduction new less depreciation theory of valuation at 1920 prices.

2. $900,000.00 estimated present fair value for rate making purposes.

3. $624,548 present value based on reproduction new less
5 depreciation theory of valuation at pre-war prices.

4. $397,964.39 based on reproduction new less depreciation theory of valuation with 1915 prices as the basis, plus additions to capital made since December 31st, 1915, which includes nothing for going value, water rights, and other intangible elements of value which were properly considered in the other estimates.

5. $460,000.00 fixed by the Commission in its order, which is based upon the original value of $360,000.00 found by the Commission in its former order, plus additions made to the plant subsequent to the former valuation.

Petitioner would further show that on the 7th day of September, 1921, the Commission handed down its opinion in the said cause with the order herein complained of attached wherein said Commission places a value on petitioner's plant for rate making purposes at the sum of $460,000.00; that said valuation is, in fact, based upon the previous finding of the Commission fixing the value of the applicant's plant at $360,000.00, plus $92,520.53 additions to capital made since the former finding of the Commission, which said $92,000.00 includes $25,000.00, the value of the plant of the Bluefield Valley Water Works plus ten per cent for going value which was not allowed by Commission in its former holding.

Your petitioner further represents that the said value so fixed by the Commission does not represent the present actual value of the plant of the applicant used and useful in the service of the public, and that the rates fixed by the Commission based upon the said valuation of $460,000.00 will not produce a fair and adequate return upon the present value of petitioner's plant used and useful in the service of the public.

Your petitioner says that it is aggrieved by the entry of the said order and says that said Commission erred:

6 1. In refusing to overrule, set aside, revise and change its findings as to value of the plant of the applicant company, and in finding the said value of the said plant and property to be $360,000.00, plus additions made since 1915.

2. In placing a value of $460,000.00 upon the plant as the basis upon which to predicate its findings as a fair return to this petitioner, and in disregarding the reports and testimony of the expert witnesses as to the present actual value of the plant and equipment of the company.

3. In taking past cost less depreciation as the basis of determining the value of the plant prior to 1915 and in adding to it the cost of additions since 1915 less depreciation as a method of determining present value.

4. In discarding and refusing to consider the evidence as to the present value of the plant, determined in accordance with present day prices, and in discarding the said testimony and basing all calculations upon past or pre-war costs.

5. In refusing to allow to the petitioner a fair and adequate sum for water rights, overhead expenses, operating capital, cutting through pavements to lay mains, and other items set out in the valuation of the said plant by the witnesses.

6. In using the straight line method of determining depreciation in the face of the evidence that the sinking fund method is the only fair and just method of determining depreciation of a public utility.

7. In ordering the petitioner to make certain additions to its plant, and in failing to provide in the said order for a return upon the additions thus ordered by it, and in directing petitioner to expend large sums in the improvement of its plant when it is disclosed by the opinion of the Commission that the rates allowed petitioner have not afforded a fair return upon the value of its present plant.

8. In holding that the applicant is entitled to a return of
7 only eight per cent upon the value determined by the Commission as the actual value of the plant, and in refusing to increase the rate of return upon the said value to correspond with the shown increase in interest rates and returns upon other investments.

9. Because the Commission by its holding and its said order refused to allow your petitioner a fair and just return upon the value of its plant used and useful in the service of the public, and by its order deprives your petitioner of just compensation and the rates fixed by said Commission in its order are confiscatory and repugnant to Clause 1 of the Fourteenth Amendment of the Constitution of the United States in that the said order deprives your petitioner of its property without due process of law and without just compensation therefor, and denies to your petitioner the equal protection of the law.

10. That the said final order is erroneous in other respects as will appear from the inspection of the record in this case.

A copy of this petition has been served upon the Secretary of the said Commission, as required by Statute.

Your petitioner therefore prays that the order entered herein by the Public Service Commission of West Virginia on the 7th day of September, 1921, as aforesaid, be suspended, and that a time be set for a hearing of this application; that the orders so entered as aforesaid be reviewed, reversed and set aside, and that this Court enter such orders as may be proper in the premises.

BLUEFIELD WATER WORKS & IMPROVEMENT COMPANY, A CORPORATION,
By COUNSEL.

SANDERS, CROCKETT, FOX & SANDERS.

8 I, A. G. Fox, Attorney-at-law, practicing in the Supreme Court of Appeals of West Virginia, do certify that, in my opinion, the order herein complained of is erroneous and that the same should be suspended, reviewed and reversed.

This the 29th day of September, 1921.

A. G. FOX.

8½ [Endorsed:] Petition. Bluefield Water Works & Improvement Company, Petitioner, vs. City of Bluefield, a Municipal Corporation, Respondent. In re application of the Bluefield Water Works & Improvement Co. for a re-valuation of its plant and authority to increase water rates. Sanders & Crockett, Attorneys at Law, Bluefield, West Virginia.

9 Pleas Before the Supreme Court of Appeals of the State of West Virginia.

At a Regular Term of the Supreme Court of Appeals, continued and held at Charleston, Kanawha County, on Wednesday, the 23rd day of May, 1917, the following order was made and entered, to-wit:

CITY OF BLUEFIELD

VS.

BLUEFIELD WATER WORKS AND IMPROVEMENT COMPANY.

This day came the Bluefield Water Works and Improvement Company, by Sanders & Crockett, its attorneys, and presented to the Court a petition praying for the suspension of an order of the Public Service Commission entered on the 24th day of April, 1917, in a case in which the City of Bluefield was complainant and said petitioner was defendant, which petition is ordered filed, and no request for a temporary suspension of the order complained of having been made, it is ordered that this proceeding be set for final hearing on Wednesday, the 5th day of September, 1917.

The petition aforesaid, and the papers, documents evidence and records, or certified copies thereof, as certified to this office, are in the words and figures following:

10 In the Supreme Court of Appeals of West Virginia, Charleston.

CITY OF BLUEFIELD, a Municipal Corporation,

vs.

BLUEFIELD WATER WORKS AND IMPROVEMENT COMPANY, a Corporation,

and

In re BLUEFIELD WATER WORKS AND IMPROVEMENT COMPANY.

Upon Application for Authority to Increase Rates, Tolls, and Charges for Water Before the Public Service Commission of West Virginia.

Petition.

To the Honorable Judges of the Supreme Court of Appeals of West Virginia:

Your petitioner, Bluefield Water Works and Improvement Company, a corporation created and existing under and by virtue of the laws of the State of West Virginia, would respectfully show that it is the defendant in the first of the above named causes, and that it is the petitioner in the second of the above named causes; that it is aggrieved by a final order entered in the above entitled causes by the Public Service Commission of West Virginia, on the 24th day of April, 1917.

Petitioner would further show that on the 18th day of August, 1914, the City of Bluefield filed a formal complaint against this petitioner, in which it claimed that its citizens, the consumers of water, were aggrieved by reason of the enforcement by petitioner of certain of its rules; that on the 2nd day of September, 1914, petitioner filed its answer to said complaint; that thereafter, to-wit, on the 14th day of April, 1915, petitioner filed its formal petition with the said Public Service Commission of West Virginia,
11 asking for an increase of rates for the furnishing of water to the citizens of Bluefield; that public notice of said application was given by the publication thereof as required by said commission; that said cause was set down for hearing by said commission on the 13th day of May, 1915, and upon said date the City of Bluefield appeared and opposed the increase of rates asked for by petitioner; and that said City of Bluefield and said commission further requested that petitioner produce an inventory of all of its property and equipment used in connection with its water plant, together with the cost of operation, maintenance and income derived therefrom; that on the 22nd day of May, 1915, an order was entered by said commission consolidating the said two causes, and on the 27th day of July, 1916, evidence of witnesses was concluded and

a final hearing was had in said cause, briefs being thereafter filed by counsel for both sides.

Petitioner would further show that upon being directed to furnish an inventory of all of its property, equipment, etc., it employed the services of John W. Alvord, an expert hydraulic and sanitary engineer, who together with W. E. Miller, another expert, employed by the City of Bluefield for the same purpose, proceeded to make and did make a complete inventory of petitioner's entire plant and submitted their reports to said commission; that the lowest valuation of petitioner's plant was made by the said W. E. Miller, employed by the City of Bluefield as aforesaid, who valued said plant, after making all deductions for depreciation, at the sum of $392,-739.00. The said John W. Alvord showing the value of petitioner's plant, according to a report made by him thereon, to be the sum of $540,000.00;

And petitioner would further show that after the introduction of all the other evidence in said cause, H. E. Nease, Chief Statistician of said commission, at the request of said commission examined petitioner's books and furnished to said commission a report thereon showing a total gross investment by said petitioner since its
12 organization, as shown by its books, of the sum of $407,-882.00, and that there had been charged off for depreciation from year to year, as shown by petitioner's books, the sum of $83,-445.00.

The petitioner would further show that on said 24th day of April, 1917, said Commission handed down its opinion in said cause with the order herein complained of attached thereto, wherein said Commission values petitioner's plant for the purpose of making rates at the sum of $360,000.00; said valuation being based upon the book value of your petitioner's plant as shown by the report of the said H. E. Nease, instead of the fair and reasonable value thereof as shown by expert testimony; and said Commission upon said valuation of $360,000.00 fixed the rates for the various kinds of service by the petitioner to its water-takers;

The petitioner is aggrieved by the entry of said order and says that said Commission erred:

1. In adopting the report of the said H. E. Nease, Chief Statistician, as a basis upon which to predicate its finding of a fair return to this petitioner upon the amount invested by it in its business, and in disregarding the reports and testimony of the witnesses Alvord and Miller, with respect to the value of the property so investigated.

2. Because said Commission by its holding and its said order deprives your petitioner of just compensation is confiscatory and repugnant to clause I, of the 14th Amendment to the Constitution of the United States as depriving this petitioner of its property without due process of law and denying to it the equal protection of the law.

3. That said final order is erroneous in other respects, as will appear from an inspection of the record in this case.

13 A copy of this petition has been served upon the Secretary of said Commission, as required by statute.

Your petitioner, therefore, prays that the order entered herein by the Public Service Commission of West Virginia on the 24th day of April, 1917, as aforesaid, be suspended; that a time be set for a hearing of this application; that the order so entered as aforesaid, be reviewed, reversed and set aside, and that this court enter such orders as may be proper in the premises.

Respectfully submitted,

BLUEFIELD WATER WORKS & IMPROVEMENT COMPANY, A CORPORATION,

By COUNSEL.

I, Joseph M. Sanders, Attorney at law, practicing in the Supreme Court of Appeals of West Virginia, do certify that in my opinion the order herein above complained of is erroneous and that the same should be suspended, reviewed and reversed.

This 23rd day of April, 1917.

JOSEPH M. SANDERS,

[Endorsed:] In the Supreme Court of Appeals of West Virginia. Charleston, City of Bluefield, a Municipal Corporation, vs. Bluefield Water Works & Imp., Company, a Corporation, etc. Order.

14 No. I.

Before the Public Service Commission of the State of West Virginia.

BLUEFIELD WATER WORKS & IMPROVEMENT COMPANY, a Corporation.

against

THE CITY OF BLUEFIELD, a Municipal Corporation.

Application for Permission to Change the Rates and Charges Now Existing for Water to the said City of Bluefield and the Citizens and Inhabitants Thereof by the Applicant, The Bluefield Water Works & Improvement Company, under and by Virtue of a Franchise Granted to It by the said City of Bluefield.

To the Honorable Public Service Commission of the State of West Virginia your petitioner respectfully shows:

1. The said city of Bluefield is a municipal corporation, created under and by virtue of the laws of the State of West Virginia.

2. That this petitioner, the Bluefield Water Works & Improvement Company, is a public service corporation, created and organized under and by virtue of the laws of the State of West Virginia, and as such public service corporation has for many years been furnishing and supplying water to the said city of Bluefield, and to the citizens and inhabitants thereof, under and by virtue of a franchise granted to it, the said petitioner, by the said city of Bluefield.

3. That during the whole time that petitioner has been furnishing and supplying to the said city of Bluefield, and the citizens and inhabitants thereof, as aforesaid, under said franchise, the rates and charges for the water so furnished and supplied have been and are now as follows:

15 *Schedule of Rates.*

Dwelling Houses, per Year, Occupied by One Family.

One year for one hydrant or spigot	9.00
Each bath tub	3.00
Each shower bath, not connected with bath tub	3.00
Each water closet, each bowl	3.00
Each urinal	1.50
Each set basin, each	1.50
One set of wash tubs, not exceeding three tubs	5.00
Each additional set of wash tubs	2.00
Each family having separate fixtures will be charged the same as if living in a separate house. If using the same fixtures, each additional family will be charged	9.00

Water rents at the above rates are to be paid strictly in advance. See Rule 22.

Boarding and Lodging Houses, per Year.

For six rooms or less	12.00
Each additional room without spigot	1.00
One room or hall with spigot and washstand	3.00
Each additional room with washstand and spigot	1.50
Water closet, each bowl	7.50
Urinal	3.00
Sink, slop over one	5.00

Water rents at the above rates to be paid strictly in advance. See Rule 22.

Hotels, per Year.

Each room including those occupied by the proprietor, his family and employes	1.00
Water closet, each bowl	7.50
Urinal	3.00
Set basin, each	3.00
Billiard saloon	10.00
Bowling Alley	10.00
Bath tub	5.00
Laundry	15.00
Bakery	15.00
Bar Room	25.00
Hose	10.00

Water rents at the above rates are to be paid strictly in advance. See Rule 22.

16 Fountains.

The following fixtures will be allowed and furnished with water only on metered services:

Sprinkler, or moveable fountain for lawn, or garden, centre fountain, fountain in yard of garden, or garden hydrants, street, window and pave washers.

Livery Stable, per Year.

Fifteen stalls or less, each stall, not exceeding fifteen (15)	2.00
Each stall exceeding 15 and not exceeding 25	1.00
Twenty-five to 40 stalls, each stall, exceeding 25 and not exceeding 40	.75
Over 40 stalls, each stall exceeding 40	.50
Hose for livery stable 15 stalls or less, each stable	10.00
Hose for livery stable 15 to 25 stalls, each stable	15.00
Hose for livery stable 25 to 40 stalls, each stable	20.00
Hose for livery stable over 40 stalls, each stable	25.00
Hacks, each	3.00
Hearse	3.00

Water rents at the above rates are to be paid strictly in advance. See Rule 22.

Printing Offices, per Year.

Printing Office	10.00

Water rents at the above rates are to be paid strictly in advance. See Rule 22.

Restaurant and Eating Houses, per Year.

Restaurant or eating house, without bar attached	12.00
Restaurant or eating house, with bar attached	35.00

Water rents at the above rates are to be paid strictly in advance.

Stores, per Year.

Stores where no liquors are sold	9.00
Stores with license to sell spirit or malt liquors	25.00

Water rents at the above rates are to be paid strictly in advance. See Rule 22.

17 Building Purposes.

Laying brick per 1,000	.15
Masonry, per cubic yard	.06
Water used in the construction of artificial or cement pavements, paid in advance, per sq. yd.	.05
Plastering, per 100 square yards	.30

Or on metered services at 25 cents per 1,000 gallons.

Water for building purposes will be furnished only under special permit. See rules.

Sundries.

Post Office	9.00
Banks	12.00
Butcher Shop	25.00
Bar Room	25.00
Barber Shop	10.00
Billiard Saloon	10.00
Bowling Alley	10.00
Bakery	15.00
Buggy	1.50
Bath tub, public	5.00
Boiler with engine attached, for each horse power	3.00
For each horse power of boiler, above capacity of engine	1.00
Boiler when used without engine, each horse power	2.00
Horse, mule or cow, not belonging to livery stable	2.00
Laundry	15.00
Machine Shop	15.00
Offices with spigot	5.00
Two or more offices using the same spigot, each	2.50
Photograph Gallery	12.00
Theater or public hall	10.00
Work Shop	9.00
Water closet, each bowl, public	7.50
Urinal	3.00
Water closet, private, each bowl	3.00
Wash basin or box not otherwise provided for	3.00
Soda fountain, six months	10.00
Tumble washer	15.00
Tumble washer, continuous, six months	30.00

Water rents at the above rates are to be paid strictly in advance. See Rule 22.

Meter Rates.

All bills for water shall be computed each month, upon the following rates and basis: 25 cents per 1,000 gallons.

All water that passes through the meter will be charged for, whether the water is used or wasted.

A minimum charge per month will be made should the amount of water as registered by the meter and charged for as above, not amount to that sum.

The minimum rate shall start from the date of the contract.

18 Special Rates.

Any private consumer, desiring a lower rate can obtain same by signing a special contract at any one of the following rates:

20c. per 1,000 gallons.....	$6.50	monthly	minimum	rate.
17½c. per 1,000 gallons.....	16.50	"	"	"
15c. per 1,000 gallons.....	50.00	"	"	"
12½c. per 1,000 gallons.....	125.00	"	"	"

Minimum Charges.

For water supplied through a one-half inch meter, per month	.75
For water supplied through a three-fourth inch meter, per month	4.75
For water supplied through a one-inch meter, per month..	6.00
For water supplied through a one and one-half inch meter, per month.....	15.00
For water supplied through a two-inch meter, per month..	35.00
For water supplied through a three-inch meter, per month	85.00
For water supplied through a four-inch meter, per month..	210.00

At least the minimum consumption noted above will be charged notwithstanding a less amount may have been registered by the meter. The fact that the minimum consumption charged has not been used in any month shall not entitle the water taker to any credit for such deficiency in case the minimum is exceeded in the next subsequent month.

Meters will be read near the last of each month and bills presented the first day of the month immediately following month in which the service was rendered, and if not paid within 30 days after the date of same the water will positively be cut off, and interest charged together with the actual cost of cutting the supply off and turning it on again will be made and collected before the water is again turned on.

All Rules and Regulations and parts of Rules and Regulations inconsistent with the provisions of these Rules and Regulations and coming within the perview thereof, are hereby cancelled.

Approved by the Board of Directors, March 25, 1908.

19 4. That during the whole time that this petitioner has been furnishing water to the said city of Bluefield, and the citizens and inhabitants thereof, as aforesaid, that the said rates and charges therefor, as shown in the schedule above, have been the rates and charges for said water, and that said schedule of rates are now the rates and charges for the water being furnished by this petitioner under its franchise as aforesaid.

5. That this petitioner proposes to change the rates and charges for water to be hereafter furnished to the said city of Bluefield, and the citizens and inhabitants thereof, and to fix the rates and charges for said water to be so furnished, as follows:

Schedule of Proposed Rates and Charges.

Domestic rate 50 cents per each 1,000 gallons, with a monthly minimum charge of $1.00; all domestic services to be metered.

Special Rates.

30 cents per 1,000 gallons, monthly minimum charge	7.50
20 cents per 1,000 gallons, monthly minimum charge	16.50
15 cents per 1,000 gallons, monthly minimum charge	50.00
12½ cents per 1,000 gallons, monthly minimum charge	125.00

Monthly Minimum Charge for Meters.

½ Inch Meter	1.00
¾ Inch Meter	4.75
1 Inch Meter	6.00
1½ Inch Meter	15.00
2 Inch Meter	35.00
3 Inch Meter	85.00
4 Inch Meter	210.00

Fire Protection.

Public fire hydrants $40.00 per year, payments to be made quarterly.

Private fire hydrants $40.00 per year, payments to be made quarterly.

Private stand pipes with hose connections $40.00 per year, payable quarterly.

20 Sprinkler Services.

For 1,000 heads or less $100.00 per year, payable quarterly; each additional head 5 cents.

6. That the change in the rates and charges for water to be hereafter furnished to the said city of Bluefield, and the citizens and inhabitants thereof, proposed as aforesaid, are reasonable rates and charges, and the reasons for changing the rates and charges for the supplying of said water as proposed, as aforesaid, are as follows:

(a) That due to topography of the country and the elevation of the said city of Bluefield, the furnishing of water to it, and to the citizens and inhabitants thereof, has always been attended with great difficulty and large expense; that it is not located upon any water course, but that it is located upon the summit between the source of Bluestone River on the west and the source of East River on the east, lying between Stonyridge on the north and East River Mountain on the south; and that the nearest point to a stream of water, or water course, is about three (3) or four (4) miles west to Bluestone River, running through the State of Virginia, where this petitioner

could not enter and procure water, except by private contract. And that as to this stream of water the Norfolk & Western Railway Company has procured and now holds the water right from its source to a point at Bluestone Junction, about twelve (12) miles northwesterly from the said city of Bluefield. And that the point on Bluestone River, mentioned as being about three (3) or four (4) miles from Bluefield, is included within the rights of the Norfolk & Western Railway Company.

(*b*) That this petitioner began the building of its plant about the year 1890. The population of Bluefield in 1890 was 1,775; in 1900 it was 4,644; in 1910 it was 11,188, and is now about 15,000. These figures, except as to the present population, are taken from the United States Census Reports, and that at the time this petitioner began the building of its plant it had purchased, at large expense, certain springs located on the north side of East River Mountain, at a much higher elevation than the said city of Bluefield, thereby enabling it to supply to the then population of the said city of Bluefield, water from the said spring on the East River Mountain, by gravity; but on account of the rapid increase of the population of the said city of Bluefield, that it became necessary for this petitioner, at large and heavy expense, to buy other large springs located in the vicinity of the said city of Bluefield, and to build and establish large and expensive pumping stations, and to construct and extend its water mains, at a large and heavy expense.

21

(*c*) That the present supply of water is scarcely adequate to the demands upon your petitioner in a dry season, and petitioner is already confronted with the necessity of securing, at great cost, an additional supply of water in order to comply with its obligations under its franchise.

(*d*) That your petitioner has now invested in its water plant the sum of approximately $314,000.00, and that during the whole time that it has been operating under its said franchise in furnishing water to the said city of Bluefield, and its inhabitants thereof, as aforesaid, that it has not averaged a net income of as much as three (3%) per cent. on the said capital invested

(*e*) That the rates now charged by petitioner to its patrons at Bluefield are very much lower than the rates charged, and allowed to be charged, by other water companies under conditions where the service is less costly to the water company than is the service rendered by your petitioner to it. It is submitted that no other company is anywhere rendering a similar service at the rates heretofore charged by petitioner, where the conditions of rendering such service are surrounded with the same difficulty as at Bluefield. Your petitioner alleges that water cannot be supplied to the said city of Bluefield and its inhabitants at the rates heretofore charged and now in force, so as to enable the Company to make a reasonable return on the money necessary to be invested.

22 7. Your petitioner therefore prays that it may be permitted to increase its rates, as herein set out, to take effect on the 1st day of July, 1915, that being the beginning of a new quarter, and the fiscal year of your petitioner; and for such other and further relief as to the Commission may seem proper.

BLUEFIELD WATER WORKS & IMPROVEMENT COMPANY,
By COUNSEL.

——— ———,
——— ———,
Attorneys for Petitioner.

23 Before the Public Service Commission of West Virginia.

BLUEFIELD WATER WORKS & IMPROVEMENT COMPANY, a Corporation,

vs.

CITY OF BLUEFIELD, a Municipal Corporation.

Application to Change Water Rates.

The City of Bluefield, in resisting the application of the Water Company to increase its water rates, has requested that the books of the Water Company be examined with a view of ascertaining certain matters referred to in the writing making this request and filed with the Commission, and the Water Company joins in the request made by the City of Bluefield, and, in addition to asking that such matter be reported upon desires to have the books of the Company examined with a view of ascertaining the following:

(1) Find out the status of the Company's affairs and all things pertaining thereto, and report as of the 1st day of January, 1915, and show further what has been added to its plant since the 1st day of January, 1915, if anything, and the cost of all additions, improvements and investments in connection with its water plant since the last named date.

(2) The amount paid by the Company for its real estate.

(3) The amount received by the Company for its real estate sold.

(4) The amount of the real estate which the Company has on hands and the actual cost thereof to the Company.

24 (5) The amount of profits, if any, the Company has realized through its real estate investments and what has become of such profits.

(6) The amount of money, if any, realized from the sale of real estate of the Company that went into the water plant of the Company.

(7) The gross receipts of the applicant Water Company from its water plant since its organization.

(8) The gross disbursements for operating expenses of the Water Company since its organization.

(9) The gross dividends paid by the applicant Company since its organization, for what years the dividends were declared and in what amounts each year, if any.

(10) To ascertain the cost of all of the Company's property used in connection with its water plant, which appear upon the Company's books.

(11) Ascertain the cost of all of the property of the Company which does not appear upon the books of the Company, such as voluntary service given by officers of other Companies, proportional service given by officers, attorneys and others connected with the land company, interest lost during construction of the Water Company's works, and like matters which enter into the past cost, but which do not usually appear in the accounting.

(12) Take up the matters year by year, first making a list of all the structures of the Company and the dates of their completion and study the vouchers and private book accounts, so that a complete statement of the amount of money put into the plant each year and the amount of money drawn out in the way of dividends, operating expenses, etc., is made to appear, so that each year may have a statement by itself, so that it may be determined, first, the exact past cost in cash, and, second, the past cost in cash plus all other values put into the plant, either by gift, unpaid services, costs incurred by other companies, deficits in operation below fair return, and like matters carefully taken into consideration in the past cost investigation.

SANDERS & CROCKETT,
Attorneys for Bluefield Water Works & Improvement Company.

Before the Public Service Commission of West Virginia.

BLUEFIELD W. W. & IMP. CO.

VS.

CITY OF BLUEFIELD.

In re Application of BLUEFIELD WATER WORKS & IMPROVEMENT COMPANY to Change Rates.

It is desired by the City of Bluefield which is resisting this application that the books of the applicant be examined, with a view of ascertaining the following:

I. The amount of capital stock of the applicant which has been subscribed, when such subscriptions were made, how much was paid

for such stock and in what manner the payments were made and when.

II. What disposition was made of the capital paid in; that is to say, what did the applicant get for its capital stock, and if money was received for the whole or any part of it, what was done with the money.

III. If the applicant has any real estate now held for its benefit or the benefit of its stockholders by a trustee, the amount thereof and the value thereof, and where situate.

IV. The expenses of the applicant for the last ten years for the operation and maintenance of its water plant, giving in detail what each item of expense was for, to whom paid, and the amount thereof.

V. The amount expended by the applicant for its water plant, giving the items covered by such expenditures, the dates thereof and the amounts thereof.

VI. The amount paid by the applicant in dividends on its capital stock, showing when each dividend was declared and the rate of dividend and amount of each dividend.

27 VII. The amount paid by the applicant for real estate and for buildings which are not and were not purchased for use in furnishing water, when paid; what disposition has been made of such real estate; the amounts received for that part thereof that has been sold and when received.

VIII. The gross receipts of the applicant from its water plant for the last ten years, giving it by years and separating the amount received from public hydrant rentals and that received from private consumers.

IX. What amounts have been paid by the applicant for salaries of officers and clerical or other services and for office expenses at its Philadelphia office during the last ten years, by years; to whom such payments were made and the amounts paid to each party by months or years.

X. The amounts paid by the applicant for salaries of officers, superintendents, foremen, clerks or clerical assistance at its Bluefield plant during the last ten years, by years; the parties to whom such payments were made and the amount annually paid to each of such parties.

HAROLD A. RITZ,
Attorney for City of Bluefield.

27½ BLUEFIELD WATER WORKS AND IMPROVEMENT COMPANY

v.

THE CITY OF BLUEFIELD.

TRANSCRIPT OF EVIDENCE.

Charles V. Price, Shorthand Reporter, Welch, W. Va.

28 NOTE.—It is agreed between the parties hereto that the inventory of the property filed with the evidence of this witness, designated on the back thereof "Inventory of the properties of the Bluefield Water Works and Improvement Company, Bluefield, West Virginia, January 1st, 1915," is a correct inventory of the property of the said Bluefield Water Works and Improvement Company used in connection with its water plant, and in connection with furnishing water to the City of Bluefield and the citizens thereof, with the exception that as to the following items there is a difference between the parties as to the quantities thereof, to wit: page 49 of the inventory, cubic yards concrete in spring house; page 50, square yards shingles on spring house, page 50, length of 18-inch tile pipe in spring house; page 61, cubic yards earth excavation in Ada pumping station, building foundation; page 61, cubic yards concrete in foundations of building; page 61, cubic yards concrete in walls; page 62, lumber in roof and ventilator; page 62, wainscoting of engine room; 62, roofing lumber and moulding; page 82, rock excavation for building site, Ada pumping station; page 92, cast iron pipe, tonnage.

29 Before the Public Service Commission of West Virginia.

Bluefield, W. Va., July 24-27, 1916.

No. 368.

BLUEFIELD WATER WORKS AND IMPROVEMENT COMPANY, a Corporation, Applicant,

v.

CITY OF BLUEFIELD, a Municipal Corporation, Respondent.

Application of Bluefield Water Works and Improvement Company for Authority to Change Water Rates.

Present: Hon. Elliott Northcott, Commissioner.

Appearances:

For the applicant: Messrs. Sanders & Crockett (Judge Sanders); A. G. Fox, Esq.

For the respondent: Harold A. Ritz, Esq.

30 *Index.*

Witnesses.	Direct.	Cross.	Redirect.	Recross.
For the applicant:				
John W. Alvord	4	67	141	167
William McCarthy	172	220	267	...
" " (recalled)	292	...	...	...
A. L. Rhoads	294	...	...	...
Wm. H. Triol	295	301	...	...
For the respondent:				
Walter E. Miller	313	371	...	...
Rebuttal:				
William McCarthy	397	397	400	...
John W. Alvord	402	...	...	...

31 Before the Public Service Commission of West Virginia.

Bluefield, W. Va., July 24, 1916.

No. 368.

BLUEFIELD WATER WORKS AND IMPROVEMENT COMPANY, a Corporation, Applicant.

v.

CITY OF BLUEFIELD, a Municipal Corporation, Respondent.

Application of Bluefield Water Works and Improvement Company for Authority to Change Water Rates.

Be it remembered, that upon a hearing of this cause at the offices of Sanders and Crockett, at Bluefield, West Virginia, before the Public Service Commission of West Virginia, the Bluefield Water Works and Improvement Company, the applicant, to maintain the issue and in support of its application for a change of water rates, introduced before the Commission the following evidence, to wit:

32 JOHN W. ALVORD, a witness introduced on behalf of the applicant, having been first duly sworn by the Commissioner, testified as follows:

Direct examination.

Judge Sanders:

Q. Mr. Alvord, where do you live?
A. I live in Chicago.

Q. And what is your profession?

A. Hydraulic and sanitary engineer.

Q. How long have you been following this profession?

A. About thirty-six years.

Q. And what class of work is included in your work in this profession?

A. Very largely the construction of water works, remodeling of water works, investigations for new supplies, and also drainage and sanitary works, and river regulation, flood protection, and other lines of hydraulic engineer.

Q. I wish you would please state whether, during the time that you have been engaged in following your profession as stated,—that you would tell how extensively you have been engaged in it. Explain fully all of that.

A. Well, I have been employed by something over three hundred cities in various parts of the country to advise them as to their sanitary and hydraulic works—water works and water supplies—and I have been engaged on such works approximately all of my professional life.

33 Q. Has the following of your profession been your principal life work since you entered into it?

A. Yes, sir.

Q. Have you been actually engaged in the laying out or the building of water works—plants?

A. Yes, sir.

Q. Please state what actual experience you have had in regard to this class of work.

A. Well, my earliest work was in connection with the Chicago Water Works. I was engaged in the construction of the—what is now known as the Lakeview station, a tunnel and pumping station producing system for the northern part of the city; and later on I was engaged in the construction of the tunnel and pumping station distribution system of what is known as the Hyde Park district, the southern part of the city. Later on, as independent—In all of this work I was assistant engineer. Later on, as an independent practicing engineer, I had charge of the construction of a good many works, the remodeling of a good many works. I don't suppose I am able to recall them all, but among them are the water works at Gary, Indiana, for the United States Steel Corporation, which involved a tunnel under Lake Michigan and large pumping station; the new works at La Crosse, Wisconsin, which were entirely—almost entirely rebuilt a couple of years ago; the

34 pump rebuilt a couple of years ago; the pumping works and filtration works at Evansville, Indiana, and a great number of smaller works; additions and enlargements to the works of Des Moines, where I have been consulting engineer to the company for some ten years; additions and enlargements to works of Grand Rapids—to the city of Grand Rapids. At the present time I am engaged in building a filter plant at East Chicago, Indiana; another filter plant at Lawrenceville, Indiana; and I have recently completed the new works at Richmond, Indiana—the additional works to the pumping station at Richmond, Indiana; and Burlington,

Iowa, and a good many other places I can't at this moment recite without referring to memoranda.

Q. This is an application made by the Bluefield Water Works and Improvement Company to the Public Service Commission of West Virginia for authority to change its water rates for water furnished to the city and to the inhabitants thereof. I will ask you to state if you have been engaged by the Bluefield Water Works and Improvement Company to value its property and plant used by it in connection with the furnishing of this water.

A. Yes, sir.

Q. Have you made such valuation?

A. Yes, sir.

Q. Upon what did you base your valuation? I mean to say, was that upon an inventory or report of the property used by the water company in connection with its water plant?

35 A. Yes, sir. The inventory was prepared under my direction by one of my assistants, Mr. Luce, which undertook to state the kind and arrangement and a description and life of all the various structures, machines, and pipes, and parts of the property of the Bluefield Water Works and Improvement company.

Q. I have an inventory of the properties of the Bluefield Water Works and Improvement company, or Bluefield, West Virginia, dated January the 1st, 1915, together with certain maps and diagrams of said property, and I will ask you to file this report or inventory with your evidence, marked, "Inventory of the property of the Bluefield Water Works and Improvement company, Bluefield, West Virginia, January 1st, 1915," which appears to be endorsed on the back of said inventory.

A. Yes, sir. I file the said inventory marked as requested.

NOTE.—It is agreed between the parties hereto that the inventory of the property filed with the evidence of this witness, designated on the back thereof "Inventory of the properties of the Bluefield Water Works and Improvement Company, Bluefield, West Virginia, January 1st, 1915," is a correct inventory of the property of the said Bluefield Water Works and Improvement company used in connection with its water plant, and in connection with furnishing water to the City of Bluefield and the citizens thereof, with the exception that as to the following items there is a difference between the parties as to the quantities thereof, to wit: page 49 of the inventory, cubic yards concrete in spring house; page 50,

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NOTE.—The inventory referred to was filed as evidence, marked as requested, and is hereto appended.

Q. You made a report of the valuation of the water works property of the Bluefield Water Works and Improvement company, did you, Mr. Alvord?

A. Yes, sir.

Q. Have you a copy of that report?

A. Yes, sir.

Q. I hand you a report of the values of the property of the Bluefield Water Works and Improvement company, endorsed on the back thereof as follows: "Report upon the value of the water works properties of the Bluefield Water Works and Improvement company, Bluefield, West Virginia, January 1st, 1915," and ask you if that is your report of the values of the property of the Bluefield Water Works and Improvement company, and if so file the same as part of your evidence.

A. It is, and I file the same herewith.

NOTE.—The report referred to was filed as evidence, marked as requested, and is hereto appended.

Q. Are these valuations of the company's property as
37 shown by your report correct valuations of its property?

A. Yes, sir, so far as I know and can determine.

Q. I wish you would please state how you made these valuations and in what way you determined the correctness thereof.

A. Well, perhaps it is not quite proper to say that a valuation is ever correct, because a valuation is a matter of opinion—intelligent opinion—but it can be correct so far as the reasoning which accompanies it is correct; and I think the important part of valuation work is correct reasoning. If you would like to have me explain the reasoning——

Q. Oh, yes.

A. The fundamental reasoning which I would use in valuing this property is that the value must be found as of today, and of the property as a whole, as a going concern, and any evidence which I can get which will show the value today is valuable evidence, and the most valuable evidence which I can get is what it would cost to reproduce the property as of today, under the conditions existing in Bluefield as of today. This line of evidence is useful when four fundamental conditions obtain; first, that the property is needed in its present condition and shape—that there is a need for it: a need
such as would require it to be reproduced if it did not exist;
38 second, that it has been built with intelligence and good engineering—good application to the service in hand; third, that the service is worth to the consumer what it is found necessary to support the value; and fourth, that there has been no dishonesty in connection with the financing or the construction. When all those fundamental conditions are present, I take it that a plant or a property of any kind is worth what it would cost to reproduce it, less any depreciation or lessened value which the existing property has by reason of its age. Acting on this theory, I have estimated, first, what it would cost to reproduce a property precisely similar to this property new, in Bluefield, beginning approximately with the

date of this valuation, laying out a plan by which it could be brought into being in a practicable manner—in a way that would be humanly possible—part by part, structure by structure, so as to get it into use at the earliest possible moment; and I have estimated what it would cost it to finance it into a revenue similar to the revenue now existing, and then I have figured the depreciation, which would reduce the cost of the plant new to the level of the existing property; and this I have done by estimating that part of the depreciation which relates to what might be called its insurance or amortization—that is, a sum which should be set aside to replace each part of the plant when it ceases to be useful—and the present worth of that
39 amount I have taken from the cost new, and find that the present value, as indicated by the cost of reproduction, would be approximately, in round numbers, $540,000.

There are other considerations which should be given attention in making sure that the cost of reproduction is a proper standard to apply to the property. A property in which the population and industry and business was declining would evidently not be worth the cost of reproduction; and a property which, as I have said before, fundamentally is not constructed so as to meet the needs of the community and develop best the adequate supply of those needs, is not always worth the cost of reproduction.

These various phases I have considered, and I have embodied them in my report showing the reasons on which I have concluded that in this case the cost of reproduction less depreciation is about as fair a method of finding the valuation as can be used.

Q. I see from the report of the value of the company's property which has been filed as a part of your evidence that you give certain illustrations and certain reasons for arriving at the valuations that you place upon the company's property. I will ask you to adopt these reasonings and illustrations as a part of your evidence taken in this proceeding.

A. Yes, sir.

Q. And are the reasons that you give and illustrations that you make correct reasons and illustrations for arriving at the val-
40 uations which you arrive at of the cost of the property?

A. I believe them to be, sir; yes, sir.

Q. And that belief is predicated upon your experience that you have had in making estimates of like values?

A. Yes, sir.

Q. In arriving at these values, do you take into consideration the growing needs of the city for water and the opportunities that the company has for furnishing water or the accessibility of water?

A. Not to the extent that I estimate the property is complete, or will be complete, but to the extent of knowing that what has been created is and will be valuable for future needs without material change. There is another phase, of course, answering your question, in which property of this kind is never complete, but you will always have to keep increasing it to meet the future needs of a growing population.

Q. I wish you would please state what will be the necessary out-

lay or expense to be incurred by the company to increase its water supply to meet the growing demands of the city.

A. It is my belief, based on such investigation as I have been able to make, that the company has exhausted all of the available sources of water supply, and that it must proceed to look for supplies
41 much further away and of a different character entirely from those which it has been hitherto relying upon. It is also my belief, from such information as I have had, that the company is already short of water in the dry season, and that such works should be commenced at the earliest possible moment for supplementing its supply. I have investigated three or four, I may say, other possible sources—Perhaps I ought not to say "investigated" them, but I have outlined them, which may be investigated or should be thoroughly investigated to determine their relative merits by which means the company can increase its supply. The city of Bluefield is on a divide, and the nearest available waters must be looked for at considerably less elevation, and mainly, I think, to the west. One of these sources would, in my opinion, be the impounding of the surplus, unappropriated flood waters of the Bluestone river above Graham, Virginia. This would involve going a distance of four to six miles away, building a large reservoir, acquiring land, establishing a filter plant to filter the water so as to bring it up to the purity of the present supply, building a pumping station, laying a sixteen-inch force main by which it could be pumped up into the present supply tanks of the Bluefield water company. The approximate cost of such development, which should be sufficiently large to supply the city for some time to come, which I estimate ought to be in the neighbor-
42 hood of 2,000,000 gallons a day additional supply, would be about $240,000. There are needed more mains throughout the city, in part for fire protection and in part for the extension of the domestic supply. Possibly about $40,000 should be expended inside of the next year or so for these additional mains.

There are other sources of supply which may, on more detailed investigation, prove to be equal or superior in economy to that which I have outlined. One of them relates to the surplus, unappropriated waters of Brush Fork of the Bluestone river, and another one to Mud Fork of Bluestone river; but so far as I have gone the impounded waters on the Bluestone would appear to be the most available.

Q. What did you say would be the cost of acquiring this water for the growing needs of the city, or did you state that?

A. The first cost of installation would be about $240,000 for this new additional supply, and there would be additional operating expenses, depending on the quantity of water used, which would add to the operating expenses, as well.

Q. What do you include in the installation expenses that you refer to?

A. The acquisition of a sufficient amount of land above Graham at a point up there where a dam can be constructed, the con-
43 struction of that dam to hold about 100,000,000 gallons of water, so as to store the surplus waters of the wet season for the

dry season. This is necessary because I understand that other interests have acquired water rights to the normal or dry weather flow of that stream. Then the establishment of a filter plant so as to filter this water so as to make it of equal purity with the present supply or better, and a pumping station which will lift it about 400 feet in height so that it can be delivered through a 16-inch force main some five or six miles long to the present tanks in Bluefield.

Q. Now, what do you include in what you call the operating expenses?

A. The operating expenses of this additional supply would be the maintenance and care of the dam, pumping station, and filter plant, the operation of the filter plant and of the pumping station, coal, oil, and supplies, and the depreciation, maintenance, and repair on all of those additional structures.

Q. Would there be any other expense except what you refer to as the installation expense and operating expense?

A. Not so far as I know, except the annual depreciation, of course, from those additional structures.

Q. Now, how long do you calculate that the expenditure of this sum of money will meet the requirements of the city, or how
44 long will it be after the expenditure of that sum of money until an additional sum would have to be spent, assuming that the city continues its growth in the future as it has in the last ten or fifteen years in the part, proportionately?

A. Well, the city has grown pretty rapidly, and without going into that exactly I should think that such an additional supply would last it perhaps fifteen or twenty years. If it grows more rapidly in the future than it has in the past, why it would be ten or fifteen years to come.

Q. You have familiarized yourself, I believe, Mr. Alvord, with the present water supply, have you?

A. Yes, sir.

Q. Do you know whether or not there is any other available water except water that might be acquired from Bluestone river or New river, or such as might be produced from wells?

A. None that is not polluted. Of course, the East river is to some extent available, but it is a very polluted stream. The Bluestone below Graham is of such quality that it would be undesirable. There is another stream other than those I have mentioned that is reasonably near to Bluefield. There has been some discussion, of course, in Bluefield, about going to New River, but that
45 would be a very tremendous expense, almost beyond the reach of a city like Bluefield.

Q. What is the cause of the pollution of East river and of Bluestone below Graham, Virginia?

A. Well, largely the populations of Bluefield and Graham, which are discharging into the river their sewage, even though to some extent treated, matters which ought not to be in a water supply, unless it is impossible to obtain water of a purer quality. It is not impossible to filter such waters and make them pure, but it is expensive, and requires very constant human vigilance, and should not

be done if waters of a greater natural purity, but perhaps undesirable from mud and sediment of other matters, can be obtained, which, although they have to be filtered, don't carry the possibility of bacterial infection.

Q. It is a fact that the sewage from Bluefield west of the summit and the sewage from Graham empties into Bluestone river?

A. Yes, sir.

Q. And the sewage from Bluefield east of the summit empties into East River?

A. Yes, sir, that is my belief now.

Q. The summit, of course, as we all know in the city of Bluefield, is the divide between the headwaters of Bluestone and the headwaters of East river?

A. Yes, sir.

46 Q. In speaking of acquiring water from Bluestone river, of course you don't know whether the right to acquire water from that stream could be obtained, or not?

A. Well, I have no reason to believe that the right to the unappropriated flood waters could not be obtained. I am informed and believe that the right to the ordinary flow could not be obtained.

Q. It is your information that that right has already been acquired by the Norfolk and Western Railway company?

A. Yes, sir.

Q. You know of no other springs except those which have been acquired by the Bluefield Water Works and Improvement company that could be acquired for the purposes of furnishing water to the city, do you?

A. I personally do not, although I would say that if there were springs, as probably there are, along East River Mountain further away than those which the company now have acquired, they would not be particularly valuable, because the cost of collecting and impounding them and bringing them to the city would be greater than the cost of some such method as I have outlined.

Q. What would be the cost of bringing water, or an additional supply of water to meet the demands of the city, from New River?

A. I have not made a calculation as to that, but to the
47 best of my recollection it is not less than twenty miles, and I would hazard a guess it would run considerably over six or seven hundred thousand dollars. The operating expenses would also be very great, because the lift would be very large.

Q. Are you acquainted with the values of the materials used by the company in the construction of its plant and the operation thereof as shown by the inventory of the company's property?

A. Yes, sir.

Q. Has your valuation of its property been predicated upon a correct valuation of the materials that entered into the construction and operation of its plant?

A. So far as I am able to believe, yes, sir.

Q. Have you made diligent investigation and research to ascertain these facts?

A. Yes, sir.

Q. I hand you another report, Mr. Alvord, marked for identification, "Preliminary estimates for water supply, Bluefield, West Virginia, as bearing on the value of water from the springs of the Bluefield Water Works and Improvement company, dated February, 1916," signed, "John W. Alvord," and ask you to state whether or not you made this report.

A. I did.

Q. Is this report a correct report of what it purports to be?

A. I believe it to be.

Q. Please file the same as a part of your evidence.

A. I do.

48 Said paper was filed as evidence, marked as requested, and is hereto appended.

Q. Also I have another report, marked for identification, "Report to the Bluefield Water Works and Improvement company on division of investment between fire protection and domestic supply, by John W. Alford, consulting engineer, Chicago," and signed by John W. Alvord. I will ask you if you made this report.

A. I did.

Q. Is it a correct report of what it purports to be?

A. I believe it to be.

Q. Please file the same as a part of your evidence.

A. I do.

NOTE.—Said report as filed, marked as requested, and is hereto appended.

Q. Also I have another report, marked for identification, "Discussion of differences in estimates of John W. Alvord and Mr. Miller in the cost of reproducing the property of the Bluefield Water Works and Improvement company, Bluefield, West Virginia, July, 1916," and ask you who made this report, or prepared this paper.

A. I did.

Q. Is it a correct report or presentation of the matters which it purports to report and present?

A. I believe it to be.

Q. Will you file the same as a part of your evidence?

A. I do.

49 NOTE.—Said paper was filed as evidence, marked as stated, and is hereto appended.

Q. In this report last introduced and made a part of your evidence, which is a discussion of the differences in estimates between you and Mr. Miller, I see that the first item thereon is referred to as preliminary cost. The reproduction cost is fixed by you at $14,455, by Mr. Miller at $1,000; and that the net physical value is fixed by you at $14,455, and by Mr. Miller at $1,000. I will ask you to explain how you arrived at the values placed thereon by you, and give us an explanation as to the differences between you as to these values.

A. This item, item No. 1, is what is known as the preliminary cost in the reproduction estimate; and in the plan of operation under which we are proceeding to reproduce this property, it involves all of the costs which would be incurred up to the development of a precise plan of operation and the granting of the franchise. In other words, the company would have to know just exactly what it could offer the city in the way of a water supply and in the way of financial resources before it could negotiate the franchise upon which it could proceed to build, and the cost is made to cover the business investigations and negotiations, all of the expert preliminary engineering reports which would determine what and where the water supply could be obtained, legal advice, special ex-
50 penses for testing the water sources, the optioning of real estate, organization of the company, the acquisition of franchise, which would have to be a matter of considerable negotiation doubtless with the company, and in general all those costs up to the time when the franchise is granted and accepted, after which there could be no question but what the company could know just how to go ahead and build. Mr. Miller has placed the cost of all that at $1,000——

Commissioner Northcott:

Q. Mr. Miller, the engineer for the city?
A. Yes, sir.
Q. Identify him.
A. Mr. Miller, who has made estimates herein of the cost of reproduction for the city of Bluefield, has placed this cost at $1,000. I have placed it at $14,455, which is three per cent of the cost of the physical property involved in this reproduction. That three per cent is based upon, first, an investigation in my own office of some eighteen cases where water works have been projected and built, and in which we could go back easily to our records and find the cost of engineering investigations for source of supply and outline of project. Those eighteen investigations averaged one per cent of the physical value of the property as finally built. Another one per cent, from information from various sources, has seemed to me to be the desirable amount to put in for the legal expenses,
51 which involved the negotiation of the franchise and the arrangement of the company's procedure, and the necessary advice as to various contracts for financial operation, and as to the organization of the company; and another one per cent seems to me to be necessary here in this case to take care of the general organization of the company, compensation of its officers up to the time when franchise is granted, their traveling expenses, and their negotiations, and their various expenses for clerical hire and for bookkeeping which would be involved, and their various expenses in connection with obtaining the necessary financial support for the proposed project. I feel that in this case $14,000 would be quite conservative. In fact, I am inclined to believe that the engineering investigations for a town like Bluefield—and it must be borne in

mind that this is now the investigations for a plant the size of the present plant; not the original plant—I feel that those engineering investigations probably would exceed one per cent in this case, owing to the extreme difficulty of determining which of the various sources of supply should be developed, together with the difficulty of determining how to develop sources which they already have acquired.

Judge Sanders:

Q. You have referred to Mr. Miller. Is this Mr. W. E. Miller, who has made a report of the valuation of the property of the Bluefield Water Works and Improvement company to be
52 used in this proceeding?

A. Yes, sir.

Q. Have you seen a copy of that report?

A. Yes, sir, and have a copy; and this comparison which I have made here is based on an analysis of the various figures used by Mr. Miller and then used by myself for the same items.

Q. Now, Mr. Alvord, you have gone on and give- an explanation or a comparison in values as to item 1, designated "preliminary cost," as shown on the report or discussion of differences in estimates made by yours and Mr. W. E. Miller. I will ask you now to take that report or discussion, filed with your evidence, and take up each item and give us your reasons for the valuations placed by you on the company's property and compare the differences in valuations made by you and Mr. Miller, without my asking you a question in regard to each item.

A. Item No. 2 is the real estate. Mr. Miller's net physical value is $36,575, and my value is $17,860, Mr. Miller being about seventeen thousand—about twice as great as mine. The value which I adopted for the real estate was that given me by two real estate men in Bluefield, Messrs. Donahue and Easley, who are well known here, I understand, and who reported to me the value of the lands exclusive of the improvements and of the water rights. Mr. Miller's report doesn't show how he arrived at these land values, but
53 his estimates on the cost of reproduction include the improvements on the Bailey and Ruble farms, which I have estimated to be worth $4,000. I am unable, then, to explain why he has so much greater value on this except possibly there is included in his values water rights, which he has not separated from the value of the land.

The item No. 2-B, rights of way: my value is twice what Mr. Miller's is; his value is $2,500 net; my value is $5,100. In this case I have taken the actual costs to the company, plus an allowance of $2,800 to cover the construction of the spring pipe lines, concrete houses, water troughs built by former owners of the spring tracts as a consideration for permission to build pipe lines. Mr. Miller's estimate does not show how his estimates were made.

Item No. 2-C, building and improvements, Mr. Miller puts at $5,163; I have taken them at $11,002. The principal difference in this item results from the fact that Mr. Miller includes the im-

provements on the Bailey and Ruble farms with his lands estimates, which I have estimated these separately. Mr. Miller has estimated the cost new of the office building at $4,500, and has depreciated it the amount of 45 per cent. I have taken the present worth at $4,500, and that of the garage separately at $300.

Judge Ritz:

Q. Mr. Alvord, you say it is depreciated 45 per cent. I just want to call your attention to the fact that it is depreciated $45,
54 1 per cent.

A. That is a misprint here in this report then, that you will kindly correct in your copy. It is depreciated $45, then.

Item No. 3, the gravity springs. My estimate, $13,886; Mr. Miller's, $9,142. The differences result from differences in unit prices, which are shown in the following comparison. All of this work is up on the mountain, in an inaccessible location, very difficult to get to, and I have put larger unit prices on it than would be normally the case for work around or in the city. A great deal of material—in fact, all of the material—had to be carried in. The sites, I was informed—and the inventory states—were full of rock and brush and logs, and had to be cleared at great expense; and our differences apparently result from the fact that I have put on in a good many cases a good deal higher unit prices for those works, owing to that unusual difficulty.

I have placed also a value of $40,000 on the water rights of the group of gravity springs. The group of gravity springs are those which are directly connected into the Bland street tank, and are on East River Mountain immediately south of this city. I do not find that Mr. Miller has placed any separate values on the water rights to these springs, unless it possibly appears in his real estate values, to some extent. I arrived at that value of $40,000
55 through a careful analysis, which is made in this special report already filed, entitled, "Preliminary estimates for water supply for Bluefield, West Virginia, as bearing on the value of water from the springs of the Bluefield Water Works and Improvement company. A spring which flows pure water at a sufficient elevation and sufficiently near the city of Bluefield undoubtedly has a special and unusual kind of value, and it becomes an interesting question as to how to measure that value in money. I have adopted the theory that it is worth to the city what it will cost to develop water of equal purity and equal quantity delivered into the same tank which the spring is delivered into by the next nearest available source. I have given the same attention to the Ada springs, but as those springs have to be pumped, obviously that group is not worth as much as those springs that flow by gravity. I find that the next nearest available source of water, which I have indicated in this report, in my opinion, based on such investigation as I have made, in an approximate manner, is from the Bluestone river, and that it would cost more per million gallons delivered into the tank to develop water from the Bluestone river than it now costs the company to bring in the springs by gravity from the East River Mountain

and by pumping from the Ada group of springs. I have therefore taken this difference, which is about $12 a million gallons,
56 applied it to the present consumption of the company, assumed a useful life of the springs of not more than 40 years, due to the fact that I think in time they will dry up with the deforestation of the mountain, possibly become one by one polluted from the population or the farming of the upper slop-s, and become dryer, particular- in dry weather, when they are most needed. I consequently assume that they would have an average useful life of 40 years; and I have taken the present worth of the saving which they effect for that 40 years and reduced it to its present worth, and bring it to $47,520, approximately to $50,000 in round numbers. I then apportion that saving between the Ada group of springs and the gravity group of springs, by estimating the cost of pumping the Ada group as against the cost of leading the water in by gravity; and the reasoning, which is all included in this report, appears to show me that the gravity springs, of that $50,000 in round numbers, would be worth about $40,000 extra for water rights, while the Ada group of springs would be worth only about $10,000 of the total.

I have further, as a matter perhaps more of local interest, attempted to divide this increased value of water rights among the different springs in proportion to their distance from the Bland street tank, their elevation above it, and the amount of the flow
57 which each one has, and the results of this apportionment show on page 12 of this special report; but we are chiefly concerned here and now with the excess amount which such springs are worth over and above the mere land as farming land and the improvements which the company have put on them to develop them and conduct their water, but as specially valuable sources of supply; and I know of no other way to figure it out than to measure that in terms of the cost of the next nearest available supply.

So far as my information goes, the people here in Bluefield have very extravagant notions as to the value of those springs, and it is possible that the company have, in some cases, paid more than they ought theoretically to have paid for some springs on that account. My investigation seems to disclose the fact that no more springs ought to be bought at an excessive price, because the cost of going to other sources would limit the amount that could profitably be paid for springs of that kind; but that they could afford to pay, even if they had to go to other sources, the amount of $50,000 in round numbers for the springs which they now own, some of which are shown by the detailed apportionments as worth a great deal, and others as worth very little; but taking them by and large as a group I have put on them that special value over and above the value of the land, and over and above the value of the improvements.

58 Ada Springs, item No. 4—that is, the development of the springs, spring houses, pipes, drainage tile, and all of the improvements which the company has put in, Mr. Miller has taken at thirteen thousand, I have taken at eighteen thousand plus. The differences in these are generally in the unit prices which I have used, which in many cases are larger than Mr. Miller, due to my

feeling that this work is a long way from the city and in a mountainous and hilly country, not easily traversed, and that it is very difficult of access, and that those facts inevitably increase the cost of a lot of detail work such as this involves. The water rights on the Ada springs as apportioned here is found to be $7,683 on the Ada spring itself, and Mr. Miller places no value especially for water rights.

Item No. 5, the Jarrell spring, No. 19: no allowance has been placed by either myself or Mr. Miller on that piece of property other than its value as a farm, my theory being that it would cost more to develop that water than it would to go to a source of supply which would be abundant, and would not justify the construction.

Commissioner Northcott:

Q. That spring is not now in use by the company?
A. No, sir, it is undeveloped.
Q. Then why should it have any value, if the purchase was a piece of bad judgment, and it is not in use for this public service?

59 Judge Sanders: They don't give it any.

A. This is real estate value.

Commissioner Northcott:

Q. But this is not a real estate company; this is a water company?
A. Yes, sir.
Q. Should that have any place in this valuation if it is not in use for this particular public service for furnishing water?
A. You have there a condition which you often find. Undoubtedly when the company bought that spring they thought it was necessary and useful.
Q. I am asking your opinion as to whether it was necessary and useful, and if not whether it should be included in this valuation.
A. Well, based upon my investigation, I believe it is not useful or necessary for the company to own that spring.
Q. Then do you think it should have any place in this valuation, as an expert on these questions?
A. I have given it no value.
Q. None whatever?
A. Unless the real estate is valued merely as land.
Q. That is what I am talking about. This is not a land company.
A. No, but the company didn't buy this for real estate; they bought it for water rights.
Q. Well, if it was injudiciously purchased, should it be valued, in your opinion?

A. I don't think you can call a company injudicious
60 which goes in good faith, on the theory that they have always gone, to buy the next available spring, in good faith—I don't believe that is injudicious. It may be that later events show that it wasn't the best judgment that they could have used, but we are

not to condemn them because our hind-sight is better than their foresight. I believe they should have a reasonable time to dispose of that property; and if I am right it should not form a part of the future water supply. It may be that circumstances may arise by which its value may prove to be more than I now think it is. I have had such cases arise, in which they later become useful. It lies in that borderland of judgment in which it is rather improper to be too severe, because the judge may be as much in error as the company.

Q. I understand you to state from your investigations you are of the opinion that it is not useful for the purpose of furnishing water to the city of Bluefield?

A. That would be my present attitude.

Q. Now, I am just simply asking you whether, in your opinion, or not, you think it ought to be included at any value in this inventory.

A. I think the real estate ought to be included at the value as mere land, but I think no special value should be put on the water right. They have paid for a water right. I am deducting that from it.

61 Commissioner Northcott: That is all.

A. (Continuing:) The Beaver Pond spring, there is no very serious difference between Mr. Miller and myself. We practically agree on the cost of reproduction. But the water rights, there, of course, the same difference occurs. My water right on that spring would be $2,317; Mr. Miller places no water right on it.

Item No. 7, reservoir and dam, Mr. Miller has placed a value on the dam. I have placed none. This dam, I may explain, is a reservoir just below the Ada spring into which it was planned to impound the waters of the Ada spring in wet weather and hold them so that they could be utilized in dry weather and pumped from the Ada pumping station. My recollection is that the city objected to the use of that reservoir because they thought the waters would become staled and possibly contaminated by standing so long, and the company conceded the matter, or it was adjusted in some way—I don't know the exact details—so that the reservoir was not used. That would not be my objection to placing a value on it, because I think in theory the question of impounding Ada springs is probably a correct one, especially if it should be accompanied by filtration, which might readily be done. My feeling about it is that the time has now come when this piece-meal addition to the plant had better stop, and we had better go to some abundant source of supply

62 which can be developed as a whole, which will provide for the future growth of the next ten or fifteen years of the city, with every assurance of success and with every assurance of an abundant supply; and I believe, as far as I can see into the project now, that that can be done more cheaply as a whole than by reaching out piece-meal to add to the supplies by this impounding which is here proposed, or by adding to the property such properties as the Jarrell spring, consequently I have given this no value, when Mr. Miller has put a value of $4,000.

Judge Ritz: But Mr. Miller reports that it depreciated 100 per cent.

The Witness: Oh, I didn't notice that. Probably Mr. Miller is more correct than I am. I should have placed some value on it and then shown depreciation of 100 per cent on it.

Mr. Walter E. Miller: There was an investment there.

The Witness: Yes, there was an investment there.

Commissioner Northcott: Let me get your ideas, gentlemen, on that. Because there was an investment there, and the investment turned out a bad one, do you consider it proper to show that and then show a depreciation of 100 per cent?

A. I think we should produce the property necessary for water supply purposes. This was supposed to be when it was built.

63 Q. Do you take the stand that in spite of all questions of judgment—if, for instance, this company should go out here where there was no spring and no river and build a dam that was useless and needless, there is an investment there. Do you take the position that the good judgment of the investment is not to be considered then?

A. No, sir. Just as soon as I can discern evidence——

Q. I am not talking about evidence of good faith; evidence of good judgment.

A. That is what I am talking about. Just as soon as I can find evidence that the judgment was not good, from my standpoint, and that the structure, or whatever it was, is not needed and in my belief never will be needed, then while I might recognize the investment by estimating the cost of reproduction, I would feel bound to depreciate it 100 per cent. This is a little different from that Jarrell spring, because at the Jarrell spring there has land been purchased. It has a permanent value, which can be disposed of.

Q. Pending its disposition, you think a water rate should be paid on its value?

A. No, I don't think so.

Q. Don't you say that in your inventory?

A. Possibly I do; but I don't believe, if you are going to be as strict as that, that you should throw the land out at once, until

64 it is fully demonstrated that it never will be used. I don't say that the Jarrell spring will never be used. It may be; I may be wrong.

Q. But you give it as your opinion that it should never be used?

A. As I see it now, it would be cheaper to develop water in some other way.

Item No. 8, pipe line from gravity springs to the city, differences of some $7,000 between us, in favor—I am some $7,000 higher than Mr. Miller; and this occurs, I think, largely in our unit prices. I have taken the view that this pipe line was not very accessible; it was in a valley which was very difficult of access, and a long ways from the city; and I have raised unit prices over those normally prevailing for such work in and about where it is normally done due to that fact.

Commissioner Northcott:

Q. Is there any difference there as to the unit price of the pipe—the cost of the pipe?

A. No, mostly in the hauling and laying. I think there is no difference in the price of the pipe at all.

Item No. 9, pipe line from Ada springs to the city, is in the same category; my estimate is fifty-three thousand; Mr. Miller's $47,000 plus.

Mr. Walter E. Miller: May I interject a remark here?

The Witness: Yes.

65 Mr. Miller: I have an addition to make to that item, having omitted the lead and yarn for the joints for that line, amounting to $2,808. A similar objection applies to the pipe line for the Beaver Pond spring, where I omitted the lead.

Judge Sanders: Do you remember the amount of that?

A. $277. No. 10 stands in the same category; the difference is less than here shown, in the light of Mr. Miller's addition.

Item No. 11, the Ada station building. I think our differences here are in the same category; my estimate on that station is $14,000; Mr. Miller's is $11,593. It is largely due, I think, to the fact that I have raised the normal cost of the unit price for such work, such as would be found in the city here, due to the inaccessible and difficult location in which this station is placed. It is some miles from town, down in a deep valley, quite difficult to get material there, to utilize it; and on the page here I have gone through with various differences in the unit prices, showing what they consist of in detail, but I think, in a general way, that is probably the reason for our main difference.

Steel stack, we are not so far apart on.

The coal chute, a small matter, my price is a little higher than Mr. Miller's, due, in general, I think, to the location, the difficulty of access.

66 The oil house is a small matter, mine a little above Mr. Miller's.

Q. Is that another item?

A. Item 14.

Q. Just refer to them so they may appear in the evidence there.

A. On the oil house my unit prices are larger than Mr. Miller's, for the reason I stated as to items preceding; and another reason occurs here, as well—without meaning to be critical. In very small structures, involving a small amount of materials, we always find the unit price runs up higher than it does in large structures, involving large amounts of materials; and I think perhaps I have made more allowance in that respect than Mr. Miller has made.

Item No. 15, the Worthington pump. Apparently Mr. Miller is higher than I am. No large items.

Item No. 16, the Snow pump, my value is less than Mr. Miller's. I think I had access to the cost of this engine, and was guided largely by that.

Commissioner Northcott:

Q. First cost, or present cost?

A. First cost. That station was only built about ten years ago. On the auxiliaries we practically agree.

On the boiler plant, my figures are a little higher than he
67 has, due, I think, largely to the same different view of the inaccessibility of the situation out there.

Item No. 19, piping in the Ada station, there is not a very great disagreement, my item a little higher than Mr. Miller's.

Item No. 20, the same, detailed analyses accompanying all of these.

Item No. 21, concrete retaining wall. My item here is a little larger than Mr. Miller's for the general reasons I have heretofore stated.

Item No. 22, station yard improvements. Here we seem to have disagreed on quantities. Mr. Miller's quantity on the solid rock on the side hill slopes is 500 yards, and my quantity, from the inventory, is 1,000 yards. The rock quantities shown by the inventory were carefully figured from the probable natural slopes of the rock as we were informed it existed prior to the construction of the station. Mr. Miller's price on excavating this rock was $1.50, while I have used $3. The stratifications here are inclined, and hard to blast, and the site is inacessible, and I am frank to say it is hard to believe how much rock has come out of a cut like that, where you haven't got a survey of the original conditions, and you have to rely on statements of those who remember.

Item No. 23, station miscellaneous. Mr. Miller seems to have depreciated his estimate more heavily than I have done.

68 Item No. 24, Beaver Pond station, Mr. Miller seems to have set less value on that and depreciated it much more heavily than I have done. I feel that as an emergency in time of drought that station is still very valuable, and will be for some time to come, to the company.

Item No. 25, steel stack, there is the same difference between us. Mr. Miller is more heavily depreciated than I am.

Item No. 26, the Worthington pump, we are not so very far apart on.

Item No. 27, Mr. Miller is a little higher than I am. It is not a large item.

The boiler plant Mr. Miller has depreciated very heavily. The same reasoning applies that I have stated before, that he seems to have considered this station as early going out of use, while I have thought it was going to be continually needed for some time, in times of drought particularly.

Item No. 29, piping, we are not so very far apart on. It is a small item.

Item No. 30, we are practically in agreement.

Item No. 31, a very small item, the amount of difference not worth speaking about.

Item No. 32, cast iron street mains. They are a very large item,

and we are practically in agreement on it, $43,254, my value,
69 $42,672, Mr. Miller's value. I call that practical agreement.

Commissioner Northcott:

Q. There is some difference there as to quantity that may account for part of that difference, isn't there?

A. There may be.

Judge Ritz: Not that item. That was another item.

A. Item No. 33, cast iron specials on mains, we are practically in agreement on, although I am a little shade over Mr. Miller.

Item No. 34, laying cast iron street mains, Mr. Miller's net is nineteen thousand plus, mine is fifteen thousand plus—No, just the reverse! My value, nineteen thousand plus; Mr. Miller's, fifteen thousand plus. That arises from a little difference in the use of unit prices which are given here. Now, I think that the difference between us is likely to be found in the fact that Mr. Miller is adhering perhaps more closely to the accurate prices paid by the company for piece meal work that they do around town. At any rate, whatever may have been in his mind, in my mind is this condition, that I am reproducing this property as a whole, doing it all at once, in the shortest possible time, under conditions which call for a somewhat higher cost than would be otherwise the case. The company extended it piece meal.

Commissioner Northcott:

Q. Do you think, Mr. Alvord, a job done piece meal can be done more cheaply than as a whole?

70 A. In water pipe extension, yes; because when it is done piece-meal it is done under the superintendence of the superintendent, who is already drawing a salary, and the overheads are absorbed in operating expenses and it can be done by men familiar with the locality, because they work year in and year out; and I think you can do pipe work cheaper by piece-meal than you could lay a whole distribution system at one contract.

Galvanized iron street mains, item No. 35, Mr. Alvord, $5,600 plus, Mr. Miller thirty-seven hundred plus. Some difference, accounted for, I think, in the same way—laying the cast iron mains.

Judge Ritz:

Q. Is that the pipe itself in that item, or is that the laying of it, that 35?

A. That is the pipe itself. I beg your pardon. I was thinking that was the laying.

Judge Sanders:

Q. Well, now, how do you account for that difference, then? Of course, there would be a different explanation of that?

A. Yes. Mr. Miller made an allowance for fittings of five per cent, amounting to $277. My unit prices are made on prices com-

monly prevailing prior to the outbreak of the European war. These prices are now fifty per cent higher. Quotations for July 1st, 1915, are given here, upon which I base my prices. I don't quite see where the difference could have come in that case, because I
71 don't know what quotations Mr. Miller may have had.

Item No. 36 is laying galvanized street mains, and here the difference, which is still great—my estimate about double Mr. Miller's—is, I think, accounted for by my feeling that the entire work would cost more than piece meal construction.

Item No. 37, extra for unusual excavation. My item, $10,000, his, five thousand plus, apparently differ because of my taking the hazards and the obstacles at the higher unit prices. I have taken rock excavation at $2.50 a yard; Mr. Miller has used $3 a yard; for shale Mr. Miller has used 25 cents a yard; I have used a dollar a yard. These result in the main differences between us. My estimates for shale excavation are based largely on the actual cost to the company in removing this class of materials from the trench.

Item No. 38, steam railway crossing, practical agreement.

Item No. 39, street railway crossing. Not a large item. My estimate is somewhat higher, and my unit prices are higher. B, street railway crossings, is a small item. I am slightly above Mr. Miller.

Item No. 40, cutting pavement over mains. Here is a very large item, one in which there is a radical difference of opinion. I am unable to conceive how this property could be reproduced without meeting all of the obstacles which exist in Bluefield today to its
72 building. Those obstacles are very many, and very various. They consist of increased number of pipes of other companies, increased traffic and police regulations, street crossings, increased railroad service, poles for different purposes, and a great many things that did not exist when this company first built—was first built. Now, the very object of the reproduction method, as I conceive it, is to show all of the appreciations which have occurred to the property by reason of the obstacles which would now exist to its reproduction. Of course, if we take into account depreciations, we must take into account appreciations. If there is any single appreciation which we neglect, then we vitiate our reasoning, and should count it with a similar reduction of depreciation. Therefore I conceive it, if this property is worth today what it would cost to rebuild it, it would be worth what it would cost to rebuild it under all the conditions as they exist today, and it would be an engineering impossibility to rebuild it without cutting through the pavements.

Q. What would be the cost of cutting through the pavements?

A. On this particular item, $7,744, my estimate; Mr. Miller's item, historic cost of what pavements were actually cut in the past, $233.

Q. That is a correct estimate of it, is it?

A. You mean my estimate?

Q. Yes, sir.

A. Yes, sir.

73 Item No. 41, valves on main, practical agreement.

Item No. 42, valve boxes on main, very nearly an agreement.

Item No. 43, fire hydrants, very nearly an agreement.

Item No. 44, services, unusual excavation and cutting pavements over services, a very large item, and a large difference; my item, $22,000 plus; Mr. Miller's, $2,000 plus. The same reason applies here that has been stated in connection with the paving over the mains.

Item No. 45, meters in service, Mr. Miller's is about 10 per cent higher than I am.

Item No. 46, meter boxes in vaults, I am about 10 per cent higher than Mr. Miller. Unit prices seem to have been taken by him. My price seems to have been based on the cost of those boxes to the company in the past few years.

Item No. 47, the twin tanks——

Mr. Miller: Isn't that difference about twenty per cent?

The Witness: Well, it is more than 10. Mr. Miller is $5,500; I am $6,800.

Judge Sanders:

Q. That is on the physical value?

A. That is on the net.

Q. Yes, net physical value. On reproduction you are a little further apart?

A. Yes, further than that.

Q. Did you give an explanation of the difference in that item?

74 A. I have taken a higher unit cost, in the first place, based on the average cost to the company; and in all probability I have depreciated mine a trifle more than Mr. Miller has.

Item 47, the twin tanks, fairly large item, and pretty fair agreement on it, Mr. Miller being a little higher than I am, $29,000 plus against my $27,000 plus.

Item 48, the Bland street tank, Mr. Miller's net result considerably higher than mine, my estimate net $2,410 against his $6,211. There is not a very great difference between us on the reproduction cost; all the disagreement seems to be in the depreciation, and that, of course—as we have used the same methods of depreciation—that involves a difference of opinion between us as to the future life of that plant. I don't know, of course, what was in Mr. Miller's mind, but in my mind, when we introduce new and additional supplies that tank will probably lose its usefulness and we will use the twin tanks to a much greater extent than the Bland street tank.

Item No. 49, electric transmission line. Mr. Miller net $330; I am net $621. I think it is possible that Mr. Miller has neglected the labor on this, and has taken the material only, although that is mere surmise. Mr. Miller has depreciated heavier than I have, at all events.

Items No. 50, 51, and 52, being laboratory equipment, furnishings, auxiliaries, and tools. The totals of these, my estimate,
75 $9,450; Mr. Miller's estimate, $7,560. That involves a very large number of small things; I don't know that it is very remarkable that we should not get nearer together on it.

Item No. 53, engineering and superintending, a large item, and there is some considerable disagreement. Both estimates are taken at five per cent, which is the same basis, but, of course, Mr. Miller's total physical property being less than mine, my 5 per cent amounts to more than his, and apparently he has depreciated his to a greater extent than I have mine, his net $13,600 against my net $20,500.

Item No. 54, administrative and legal costs during construction. My percentage is two per cent and Mr. Miller's is 1½ per cent; and it makes our net differ by $8,000 for my estimate and $5,000 plus for his estimate.

Item No. 55, general contingent costs. These are the things which will be unforeseen in a rebuilding. It is to be remembered that they couldn't build any property twice over again without having a different set of contingencies, and it is customary for engineers on new work to add a very large amount for this, often as much as 10 per cent. In view of the fact that we have such a definite description of the work to be rebuilt as we have in the complete specification before us, I have reduced this to 4 per cent, which would make, on
76 my physical units, $17,900, and Mr. Miller has taken 2 per cent on his physical property, at $5,886, and depreciating that would make mine $16,400 and Mr. Miller's $5,400.

Item No. 56, interest during construction. Here Mr. Miller is a little higher than I am. His interest runs $17,000 plus; mine $15,000 plus.

Item No. 57, I am very happy to say, we are in very substantial agreement, an item which is usually one of very wide difference of opinion. We both arrive at the conclusion that it is $16,000. It must be understood, however, that the revenue here is, in my opinion, far too small; the going value being based largely on the reproduction of the revenue, is much less than it would be with a normal and proper revenue.

Item No. 58, operating capital. Here Mr. Miller has taken the view that the necessary operating capital is greater than I have thought necessary; my net, $5,000; his, $7,500. I must say that my estimate is based on 25 per cent of the annual cost of operation, assuming that collections are made every three months, the necessary amount of money to carry the company for those intervals.

Q. Mr. Alvord, I omitted to ask you what experience you had had in appraisal work of this kind, therefore I will ask you to state fully what has been your experience in appraising and valuing water works and property such as the property involved here in this litigation.

77 A. A very considerable portion of my professional work in the last fifteen years has been a study of the principles of valuation and the practical appraisel of waterworks properties, some waterworks and electric light properties. I think I have been con-

nected with close to eighty different proceedings of this kind, in which the property values have aggregated about $140,000,000. These have been works all over the country, large and small. Some of the principal proceedings I have been in have been some of the earlier cases of Dubuque, Iowa, Waterville, Maine, Mobile, Alabama, Knoxville, Macon, Chattanooga, Charleston, South Carolina, Baton Rouge, Louisiana, Vicksburg, Mississippi, and a great many places north of the Ohio river, Omaha, North Platte, Nebraska, Des Moines, Iowa, Peoria, Illinois, Indianapolis, Indiana, and a large number of small places. And I would like to say this, in addition that it has been my good fortune to represent the city as often as I have represented the water company, and I have had the opportunity of seeing this question from both sides. In very many cases I have been made the third member of the board, or the neutral member. I have just completed the water works hearing at Chattanooga, where I have been the third member of the board, and am now, at the present time, the third member of the board valuing the water plant at Lake Charles, Louisiana. I am employed at the present
78 time by the city to report on a reasonable adjustment of revenue and rates for the plant at Burlington, Iowa, and I am also valuing a plant at East Chicago, Indiana, and Indianapolis, Indiana. I am making a new valuation.

Commissioner Northcott:

Q. Were you in the Knoxville case that afterwards went to the Supreme Court?

A. I wasn't in it until after the Supreme Court rendered its decision, and after they got all through fighting the city called me in and asked me to report on the value of the plant in 1913. I made a value, and upon that value the city and the company got together and passed the property.

NOTE.—At this point, it being 5:10 o'clock p. m., an adjournment was taken until 9:30 o'clock a. m. of the following day Tuesday, July 25, 1916, at which time this hearing was resumed as follows:

Judge Sanders:

Q. Mr. Alvord, you spoke yesterday of acquiring an additional supply of water by impounding process. This watershed from which the water would be impounded is located in what state?

A. In Virginia.

Q. Then, of course, that being so,—it is rather a legal question instead of an expert question—it would depend on a voluntary contract and not by the exercise of the power of eminent domain?
79 A. I presume so; that is my information, at least.

Q. You also spoke yesterday in your evidence of a filtration system for the purposes of purifying and clarifying the water from Bluestone. What would be the expense of that kind of a system?

A. It would cost about $40,000, as I remember it, to install a plant, and from fifteen to sixteen thousand dollars a year to operate it, in addition to the pumping and impounding. Those figures are in my report; I am quoting them from memory. They are in that report.

Q. There is one item in your report of valuations which is also referred to in your report of comparison of values made between you and Mr. Miller, which I find on page 117 of report upon the values of the property of the Bluefield Water Works and Improvement Company. I will ask you to make a little fuller explanation of this item, referring particularly to the service pipes—that is, what I mean by service pipes, the pipes connecting with the mains to the property of the consumer.

A. I neglected to explain yesterday, in going over the comparisons, that this item No. 44, there is quite a considerable difference between Mr. Miller and myself. I have a net estimate of the value of these services at $22,000 plus. Mr. Miller has $2,000 plus. The difference in this item is due to the fact that Mr. Miller has
80 included only the cost of furnishing and inserting the corporation cock in the mains, and assuming that the consumer would be required to bear the expense of the service connection. I have computed the whole cost of the service as being the property of the company.

Q. How is that computed by Mr. Miller in his report of values?

A. I don't recall the exact language that he uses in his report, but I gathered that he has only estimated the cost of inserting this corporation cock in the main. It is my understanding that the company put in all these services up to about 1908, something like 1,600 of them, and that from 1908 to about a year ago they required the consumer to pay a portion of them, requiring some kind of a fee, I think, for the service——

Q. Well, that is, you mean for the newly installed service pipes?

A. Yes, sir.

Q. But they didn't require the consumer to pay for the pipes that had been installed prior to the adoption of that rule in 1908?

A. No, sir. And after the order of the Commission about a year ago requiring them to maintain such property, they then, since that time, have put in all the services; and under the theory of the Knoxville decision and the ruling of this Commission I have as-
81 sumed that the services, on a reproduction at this time, are all the property of the company and must be maintained by them.

Q. Whether installed by the company or by the consumer?

A. Or by the consumer; yes, sir.

Q. Of course, you don't know just what service pipes were installed by the consumer and what pipes were installed by the company, as a matter of fact?

A. I have not made an effort in the inventory to separate those. Doubtless Mr. McCarthy can testify on that point with more accuracy than I can.

Q. You have filed with your evidence a report on the division of investment between fire protection and domestic supply?

A. Yes, sir.

Q. I wish you would please explain briefly that report.

A. In this report I have endeavored to show what portion of the final return should be theoretically derived from the public service which this plant renders and what portion of it should be derived from the private service; and in order to do this I have had to make an estimate which would divide first the investment or the value of the plant as between the public and the private service. Now, to do that, I have estimated the cost—I first have, of course, the estimated value of the plant as it now exists doing this duplicate service Then I have made an estimate of the cost of a plant as similar in all respects as possible to the existing plant, but
82 only large enough to provide for the domestic service; and I have again made another estimate of a plant similar in all respects to the present plant, but only large enough to perform the public service. Now, the combined cost of those two plants would be naturally greater than the cost of the existing plant, but they afford me the ratio or the proportion of the estimate which should be made of the existing plant as between the public and private service. That will be found in detail on this report. It then becomes necessary to take the operating expenses and apportion them in the same way, first finding the total operating expenses of the plant as it now stands, then the operating expenses of a plant furnishing only domestic service, and, again, the operating expenses of a plant furnishing the fire service only, and from the sum of those two and their ratios gives the ratio in which we can divide the operating expenses of the existing plant. We have the data then both in investment and operation for each kind of service to proportion the double service afforded by the existing plant; and I find that this ratio so determined would indicate that 35.6 per cent of the income of the Bluefield Water Works and Improvement company, the proper return, should be derived from the public hydrant rentals, or from some form of rental for the public service of fire protection. Personally, I don't believe in apportioning that on the hydrant alone; I think it should be apportioned on
83 the hydrant and the capacity of the distribution system; and I have spread my ideas on that subject on record in a paper which I have read——

Q. You will adopt that as a part of your evidence?

A. Yes, sir, I will present that as a part of my evidence.

Q. The paper that you have referred to as adopting as a part of your evidence I believe you have not yet filed?

A. I have not yet filed, but I will do so.

Q. I wish you would please do so and make it a part of your evidence, marked exhibit—what do you call it?

A. "Equitable hydrant rentals and methods for their determination."

Judge Ritz:

Q. You have that here, have you?

A. I haven't a copy of it here. I can wire for several copies and it will be here before I leave. I have reprints at the home office.

NOTE.—The paper referred to was later filed as evidence, marked as stated, and is hereto appended.

Judge Sanders:

Q. What amount of money should the city of Bluefield pay for fire protection?

A. Well, that involves the question of what amount of money the city of Bluefield should pay as a whole for water service.

Q. Well, I want your opinion about it.

84 A. That is something I don't know. I don't want to presume to anticipate the determination of the utilities commissioners, but it should be——

Q. Well, I will ask you this, what percentage of the water rates should be paid by the city of Bluefield for fire protection?

A. Well, scientifically and theoretically I believe *I believe* that 35 per cent of the entire revenue should be derived from the public service.

Q. Well, what is included in the public service that you refer to?

A. The protection from fires, the public uses of water by the city, franchise uses, if any. Any public, general use to which the city has acquired a right through its contract with the company.

Q. What is the city now paying for water—do you know?

A. Something like $3,000, I think—$3,142 I have noted here, or were at January 1st, 1915.

Commissioner Northcott:

Q. What per cent is that of the total income of the company?

Judge Ritz: A little less than 10 per cent.

A. Its total income that year was $39,800—very close to $40,000. About 12 per cent, isn't it?

Judge Ritz: No, it is about 7½.

The Witness: About 7.9 per cent.

Judge Sanders:

Q. You say that the city should pay 35 per cent for the public service. You mean 35 per cent of the total amount that is

85 paid to the water company for water supply?

A. Yes, sir, of all the return that is available to the company. It, of course, is not a material matter to the company where its return comes from; but it is a matter of equity among

the various consumers as to whether they are paying for that kind of service that they are getting or somebody else's service.

Q. And what per cent did you say that they paid last year on the total amount of the return?

A. Pretty close to 7.8 per cent.

Q. In figuring the reproduction cost of the company's plant, did you take into account depreciation?

A. Yes, sir. I have——

Q. I wish you would explain how that enters into the rate making values, please.

A. Well, in the reproduction theory, the only portion of depreciation which enters into the rate making values would be the present worth of the uncompleted depreciation on existing structures used and useful for the water supply of the city. That is only a portion of the total depreciation taking place in the plant. That amount I have computed at about $43,000, which amount I have deducted from my cost new, and therefore that empties it directly into the question of present value. It is interesting however, to point out that there are other forms of depreciation, both
86 past and present, of which that is only a part. For instance, all of the maintenance account in the operating expense is really the meeting of depreciation due to wear and tear, and is a part really of the depreciation that is taking place. That form of depreciation, however, is met month by month, and we therefore do not have to take it into account when we make an accounting of the plant annually. I have been interested to find that taking the last six years and definitely ascertaining that maintenance account, it is $33,000; and proportioning prior years for which we do not have the exact accounting on the basis of the smaller and smaller size of the plant, that the total of that maintenance for wear and tear up to the present time amounts to $105,000. That is depreciation which has been completed, which has been met, and which has been paid for by the owners of this property.

There is another form of depreciation which has been completed in the same way, and that is the obsolete structures, which we have not included in our inventory here—structures which were at one time used and useful, but which, through growth of the city, changes in the direction of its supply, have gone out of use. I have had the interest to determine approximately the kind, amount, and cost of such structures, and I believe that roughly they amount to about $45,000. That is depreciation which has been completed and paid for by the introduction of new structures of equal or
87 greater capacity by this company.

Commissioner Northcott:

Q. Mr. Alvord, does that include this unused dam that you mentioned yesterday?

A. Yes, sir. The total of those two forms of depreciation is therefore—completed depreciation in the past, is, therefore, $150,000.

Judge Sanders: I don't know that I understand just exactly what you refer to.

Commissioner Northcott: The dam that they put in intending to impound the waters of some spring, and the city objected to it.

Judge Sanders: Oh, yes.

A. (Continuing:) All that form of structure has gone out of use. The total of that completed depreciation, therefore, is about $150,000, to which should be added the depreciation which is uncompleted, unpaid for, which we have computed in this reproduction and deducted because it is unpaid for; which is $43,000, which would make a total depreciation of the plant to date, paid for and unpaid for, of $193,000. I am particularly interested in computing this, because, if I am right in my figures, this company has not been permitted to earn, at the rates, enough money to pay for that depreciation in the past, yet they have still made it good by actual cash investment.

Q. What is the value, Mr. Alvord, of the dam on East River that you have referred to? What I mean by the value is the
88 actual cost of the construction of it.

A. The cost of reproducing it. I put that at $4,000, as Mr. Miller has computed it. I didn't take the trouble to compute his figures on that; I just adopted it.

Q. I don't understand you as putting any value on it. I want to know what was the cost of building it in the first instance.

A. I didn't make, myself, that estimate. I just adopted Mr. Miller's *estate,* because this whole subject, as I consider it, is one of remote interest to the valuation here. It is simply introduced for the purpose of showing about the amount of paid for depreciation for which the company has not been permitted to recoup themselves by the rates in the past.

Q. Your report, I think, shows this, but I will ask you to state what is the total value of the property of the Bluefield Water Works and Improvement company in use in the furnishing of water to the city of Bluefield and to the citizens thereof?

A. My feeling is that that value should be placed at $540,000 for the existing property.

Q. Now, what will be the cost of the necessary equipment or addition to the company's property and plant in order to furnish to the city and to the citizens an adequate supply of water—such demands, I mean, as could be made upon the company, now, at this time.

89 A. My estimates as presented here in the supplementary report on the value of the springs would appear to show that an investment of at least $240,000 for a new and additional supply should be made at this time, and as promptly as possible, to which there should be added about $40,000 more for new distribution mains to adequately extend the present distribution system and supplement it, or a total of about $280,000 new capital ought to be found at this time. This amount, added to the value of the existing property, none

of which I can conceive is reduced by such an added investment, would bring the total value up to the neighborhood of $820,000.

Q. Suppose you figure it out and get it exact.

Judge Ritz: That is what it is.

A. $820,000; yes.

Judge Sanders:

Q. Yesterday in your evidence you referred to the Jarrell spring, wherein you stated that you didn't think it would be practicable to bring the water from this spring to the city of Bluefield. I will ask you to state how long would it take to acquire the additional supply of water referred to by you from the impounding process on Bluestone river?

A. Why, I would think that due to the fact that that proposition lies in another state, and probably a separate company would have to be formed to carry the thing through, and a good deal of
90 the success of its acquisition lies in the ability to secure a good deal of land and water rights, that it would take the best part of two years to get that in operation—actual operation. I think it would take the best part of a year to do all the legal and preliminary work there necessary to start construction, and it would take the best part of—it would take all of one good, long working season to build it, so that if—even if it were started now, hope for relief, in case you had a dry season here—dry spell—you couldn't hope for relief to the people much before the second summer from now.

Q. Pending this, then, can you say that it would not be necessary to acquire the water from the Jarrell spring?

A. Well, I am frank to say Mr. McCarthy points out to me what I had overlooked, that during that interval the Jarrell spring may have to be used, whether I think it is worth anything or not, as an emergency to make good the supply at Ada in times of dry season. If that is true, and I think that is a point well taken, that spring will undoubtedly be worth all it cost in the one season.

Q. How far from the city would your impound be that you have referred to?

A. There are two sites over there. One is in the limestone, near Graham; the other is on the shale about two miles further;
91 and I am inclined to think that a detailed and careful survey and investigation would show that we would have to go up to the site on the shale in order to be sure that our reservoir would not leak water through the caverns and the fissures in the limestone. My estimates, however, are based on the limestone site, about two miles nearer Bluefield and a distance from the twin tanks of about four miles.

Q. How would this water be impounded, the most natural way?

A. Well, we would have to provide some natural reservoir site there where we could throw a dam across Bluestone river for a reservoir which would be large enough to impound all of the necessary water in the wet season to carry the supply of Bluefield through the dry season of the year; and my recollection is that something like 100,000,000 gallons capacity would be necessary to do that in the

dryest year, although that is a matter which I have not gone into in thorough detail as yet.

Q. Could you approximate, or have you figured, what the cost of the reservoir to impound this water in would cost?

A. My approximate preliminary figures here are for a dam costing $65,000, and land costing $15,000, which totals about $80,000; to which should be added 15 per cent for engineering and contingences, something like $95,000 total—probably, in round numbers, $100,000.

92 Q. For the construction of the reservoir alone?

A. Yes, sir.

Q. Referring again to the question of depreciation, I will ask you to state what return ought to be paid to the company to provide for future depreciation—annual return.

A. Judging by a great number of trial depreciations which I have made in the past and then studied at intervals of five years, I have come to the conclusion that the average or normal plant about one per cent of the physical property—value of the physical property—should be set aside every year for that portion of the depreciation which is uncompleted, and outside of the maintenance for wear and tear. That is an average, however; and in plants situated as this is, where the source of supply is difficult, where the growth is rapid, I am inclined to think that ought to be increased to about 1¼ per cent.

Q. You and Mr. Miller practically agree on that, I believe, do you not?

A. I believe we do. I think I noticed in his report somewhere that he has adopted 1¼ per cent as being the necessary future depreciation to set aside.

Q. Mr. Alvord, during the course of your examination you have referred, in a great many instances, to unit prices. I would like to have placed in the record what you mean by unit prices—just a little explanation of it.

93 A. Well, a unit price is the amount found by experience necessary to apply to the unit of quantity of physical property in order to construct that property, and necessarily it must vary a good deal with the condition, location, amount of the property to be constructed, and difficulties encountered in constructing it. It is an amount which we engineers carry as gauging all of those conditions, and which we apply into the unit of quantities of material or supplies to produce the total. Necessarily, in a reproduction estimate, the whole of the judgment of the engineer who is making the estimate is expressed in the unit prices which he adopts, except as he is enabled to check the total cost of the structure after he has applied his unit quantities with other structures similar with which he has had experience, and carries in his mind, so as to see that he has expressed his judgment, in his opinion, properly.

Q. In what way does the inaccessibility of the springs furnishing the water supply to the city entered into the unit prices?

A. Well, they involves the construction of relatively small quantities of material, carried up the mountain side on the backs of men, altogether, entirely inaccessible, I think in almost every case, for team

work, and they involve a difficult climb every day to the work, and in many ways—rock excavation, clearing, which has been de-
94 scribed to me by the men who have actually constructed those works, has seemed to me to be peculiarly difficult and inaccessible work; and therefore, in those cases, I have raised the unit quantities so as to express my judgment of that difficulty in terms of the cost of reproduction.

I might also say that unit quantities should and do increase as the amount of work to be done diminishes. A few cubic yards of material in and out of the way place, the concrete will cost two or three times as much per cubic yard to put in place as would a hundred or a thousand cubic yards put into one structure and under one operation. I have often illustrated this difference by taking the cost of excavation. The highest cost of excavation that occurs to me is where you drive a drive well and take the sand out of the bottom of the drive well with what we call a sand pump, and under such circumstances excavation per cubic yard will run as high as $40. On the other hand, when you are sluicing with a great hydraulic dredge into a large fill by pumping the earth and the water, one of the cheapest forms of moving earth we have, that same cubic yard could be moved for a few cents—5, 6, 7, 8 cents. Now, between those two extremes, the one a great quantity of work to be done and ample means for doing it, and the other a very small quantity of work to be done and very difficult means for doing it, lie a whole series of means of doing work and a different price for doing each
95 kind of work, of which the engineer must be the judge.

Judge Sanders: I think that is all I want to ask Mr. Alvord.

Cross-examination.

Judge Ritz:

Q. Mr. Alvord, in determining the quantity of water necessary to supply the city of Bluefield, what did you figure was the amount to be provided for each inhabitant?

A. Why, I have provided probably about 100 or 125 gallons per capita some fifteen or twenty years from now.

Commissioner Northcott:

Q. Daily?

A. Daily.

Judge Ritz:

Q. Well, why don't you provide as much now as you do twenty years from now?

A. Well, I provide a good deal more than that now, if you take the total capacity of this added supply. I haven't computed that.

Q. Well, in computing the necessities of the inhabitants of the city for water, you then estimate that they ought to have 100 to 125 gallons per day per inhabitant?

A. Well, I estimate that they will use that. I don't say that they ought to have it, but I find from my experience that they will use it whether they ought to or not.

Q. Now, what is the capacity of the Beaver Pond spring?

A. I don't carry that in my mind. I have it among my
96 notes.

Q. Could you give us any idea about what the capacity of it is?

A. On my special report on the value of the springs, page 12, there is a table which gives the minimum, maximum, and average flow of all of these springs. The Beaver Pond spring is given at 175 gallons per minute minimum. The maximum is not given. It was difficult to know. The average is taken at about 525 gallons per minute.

Q. Reducing that to days, how many gallons per day would that be, minimum?

A. Well, there is 1,440 minutes in a day, isn't there?

Q. Yes. It would be about 250,000 gallons a day would it?

A. Yes, I think that is right.

Q. What is the minimum capacity per day of the gravity springs?

A. Well, the measurement of the minimum capacity of the gravity springs, about 240,000 gallons a day.

Q. And what is the minimum capacity of the Ada spring?

A. About 400,000 gallons a day.

Q. Now, that is all the present sources of supply, isn't it, Mr. Alvord?

A. Yes, sir.

Q. And that approximates 1,000,000 gallons a day?

A. Yes, sir.

Q. What would be the average capacity of those springs per day?

A. Well, it might be a million and a quarter.

97 Q. Well, didn't you state the average capacity of——

A. It is very hard to say the average capacity, because we don't know the maximum capacities very accurately.

Q. What is your estimate of the maximum capacity?

A. Personally I have made no estimate of the maximum capacities. I never had occasion to measure them. We have made a measurement of the minimum—some of the minimum capacities. The maximum capacities, I have had to depend on hearsay; and the amounts given here are the information as it has reached me from the superintendent of the water company.

Q. In calculating the minimum capacity of the Beaver Pond spring, did you include the additional spring which has recently been connected with the old spring?

A. No, sir.

Q. You don't know what the minimum capacity of that new spring is?

A. No, sir; it was not connected with the system at the time this tabulation was made.

Q. What capacity did you calculate, Mr. Alvord, on your proposed impounding system on Bluestone river?

A. I estimated on a minimum capacity of 2,000,000 gallons a day.

Q. That would be fully adequate to meet all of the needs of the city at this time, wouldn't it?

A. Well, it would be more than adequate to meet the needs of the city at this time; and if it could be economically developed
98 at a less amount than that it would be desirable to do so; but when you have to go so far and have to develop to such an extent it is very uneconomical to reduce your amount to the precise amount needed at the time. In other words, you have to develop for the future. Your pipe line, for instance, if predicated on the next few years only would be outgrown, and therefore very heavily depreciated, and you can't add to that kind of investment progressively as the need progresses.

Q. Assuming that the growth of the city would be maintained within the next ten years at the same ratio that it has for the last ten years, that plant would be adequate to meet the needs of the city for ten years, wouldn't it?

A. Oh, I would think so. I wouldn't recommend it if I didn't think it would be adequate for at least ten or fifteen years. That would be, in my opinion, the minimum time that you ought to provide for.

Q. I believe you stated that such a plant as you spoke of on Bluestone river would provide for the growth of the city for thirty years?

A. No, twenty-five years, I think I said. That would depend on the growth of the city.

Q. If it didn't grow at all it would be adequate forever?

A. I think so, if it would last.

Q. Then, Mr. Alvord, when that plant is installed, at a cost of $240,000, the present sources of supply would be obsolescent?

99 A. No, sir; they will never be less valuable, in my opinion, than they are now.

Q. What use would be made of them?

A. The same use that is made now.

Q. Wouldn't it be very much cheaper to run one plant and secure all of the water than to run two plants?

A. Yes, but the present supply is the cheapest supply, and you should add, as your needs increase, from the more expensive source. In other words, you should always operate this supply to the extent of its capacity, and as you need more water you should add from the new source of supply—the more expensive source of supply—only as you need it.

Q. Then your idea is that the more sources of supply, the more pumping stations and plants you have in operation, the cheaper you get the water as a whole?

A. No, no; that is now the way to put it, I think. The way to put it, I think, is that the nearest water and the highest elevation water is the most valuable water always in a proposition of this kind. The further away you have to go and the higher you have to pump, the more expensive your water becomes, naturally. Now, we don't

go to the more expensive water and abandon means for obtaining cheap water. That wouldn't be sound judgment or good policy. You retain the cheapest water, the water most easily reached, and you only add the other water as you need it.

100 Q. Suppose they didn't have any water here, and you were building a system here, where would you go for your water?

A. To the gravity springs, first.

Q. But I am assuming now that you have got a state of facts that you know the gravity springs won't provide for.

A. I would develop the gravity springs first.

Q. And you think it would be cheaper to supply water to the town from the gravity springs first, Beaver Pond, Ada, and all the plants operating at the same time, if it was necessary, than to supply from one plant which had the capacity to supply the whole thing?

A. Yes, sir.

Q. Would you keep the Ada plant in operation if the Bluestone plant was in operation?

A. Yes, sir, because the water from the Ada plant is cheaper than the water from the Bluestone.

Q. How much cheaper?

A. About $12 a million cheaper.

Q. I notice in your report on page 7, it being the report marked, "Preliminary estimates for water," that you estimate the cost of producing the Bluestone supply at $71.75 per million gallons.

A. Yes, sir.

Q. I get that right, don't I?

A. Yes, sir.

Q. And the cost of the present supply at $59.30 per million gallons?

A. Yes, sir.

Q. That $59.30 includes the gravity springs, the Ada sup-

101 ply, and the Beaver Pond supply, doesn't it?

A. Yes, sir.

Q. I notice on page 10 of this report that you figure the gravity group as costing $20.30 per million gallons and the Ada group at $84.70 per million gallons. Is that correct?

A. Yes, sir.

Q. Then it is not true that it costs less to get the water from Ada than the Bluestone supply?

A. Not from Ada alone; no.

Q. Then it would be advantageous to abandon the Ada supply if you put in your Bluestone supply?

A. No, I don't think so.

Q. Well, if you were paying $84.70 for your Ada supply and you could get good water from another place at $71.75, I wish you would explain why it wouldn't be more advantageous to get all from the $71.75 place.

A. Because it might be advisable, under those circumstances, to operate Bluestone for the minimum quantity and Ada for the excess quantity, but you forget that we have to produce here the maximum quantities at any time there is a fire, therefore all of these must be in reserve whether we are using them or not. We can't get along with-

out the Ada with the 2,000,000 Bluestone supply. If you were to suggest the abandonment of the Ada springs, or if, for any reason, we had to abandon them, we would be obliged, in my opinion, to increase the investment from Bluestone to 3,000,000 gallons,
102 instead of 2,000,000 which I have computed. In other words, we have our fire protection here to look for, and for that fire protection we must have the gravity springs, the Bluestone, if that is the next cheapest to operate, and the Ada, for our fire protection.

Q. It takes all of those?

A. Yes, sir; if it didn't take all of those, of course I should be in error in developing to such a great extent; but my idea is to develop the Bluestone to the extent that we need fire protection, with the supplies that we already have in hand.

Q. Well, aside from the question of fire protection, the supplies you already have are adequate, aren't they?

A. Oh, there would be times after the Bluestone is developed, undoubtedly for the first few years, it might not have to operate at all at certain seasons of the year when the water is high at other places; but you must hold it in reserve for fire at all times.

Q. The Bluestone project could be developed to the extent that would be necessary for all these purposes, couldn't it?

A. I don't know to what extent I could advise that without further investigation. There are about seventeen square miles of watershed up there, and I have estimated that that might possibly be developed to the extent of 500,000 gallons a day, which would seem
103 to indicate that we could develop to a considerably greater extent than I have estimated on.

Q. And at very little more expense?

A. Very little more—Yes, very little more expense.

Q. About how much more expense would it take to develop the Bluestone project to its maximum?

A. Oh, I don't know. I have not the data which would enable me to determine that. It might be entirely impossible to develop it to its maximum. There might be lack of storage opportunity there.

Q. You didn't look at it with a view of ascertaining to what extent it could be developed?

A. Well, the whole question needs a very thorough and careful, painstaking engineering investigation to determine precisely what can be done up there, and, of course, that I haven't given. I have only put down those things which I can see will probably work out, and I have only attempted to indicate that it is possible to get the additional water supply there rather than go to the New River or any other very distant source. I feel confident that it can be produced there; I am confident that more than 2,000,000 gallons can be developed there; but I couldn't say to what extent that watershed could be developed without a more careful investigation.

Q. Mr. Alvord, in making up your estimate of the cost of reproduction, you have included all of the items of real estate
104 owned by the waterworks company, haven't you?

A. I believe so; yes, sir.

Q. And you have included this at a value in excess of what was paid for them, haven't you?

A. No, sir. I have no knowledge of real estate values in Bluefield, and my figures are based on the report of two gentlemen who are in the real estate business in Bluefield, Messrs. Easley and Donahue. They were requested by me to give me the value of the lands without the improvements or the water rights.

Q. Without considering the question of water rights?

A. Yes, sir.

Q. Well now, item No. 1 you have here is 5/10 of an acre of land conveyed by Estill Bailey and wife. You valued that at $25. Whereabouts is that?

A. That, I understand, is the No. 1 spring shown on the map of the springs.

Judge Sanders: Well, refer to that—"filed with the inventory of the company's property."

A. Filed with the inventory of the company's property, exhibit No. 28-*a*.

Judge Ritz:

Q. Now, Mr. Alvord, these properties, as real estate, independent of their water value, are not at all useful to the water system, are they?

A. Why, certainly they are. How could you have water rights without real estate?

105 Q. Well, isn't the value of them to the water company for their water value?

A. Water value, but then you have to have real estate with any kind of a water right.

Q. Yes, but what I am driving at is this. You have valued these as real estate, then you have also valued them at what you think they are worth as water propositions, and have put both of those values in there. Doesn't the latter include the former?

A. No, sir, because when I came to value the water rights I deducted the value of the real estate and improvements. I found the value of the water right in excess, over and above the real estate and improvements, not with them.

Q. Well now, I call your attention to item No. 15, under the head of Ada springs, which seems to be a farm of 236.25 acres, that you value at $5,000 as real estate. What is the value of that, or the use of that, to the water company as a water company?

A. Well, that farm lies, as I recall it, just above the Ada spring, and the best of my recollection is that the springs on it couldn't be obtained with any less land than the purchase of the whole tract, therefore in part it has a value as protecting the lower spring from pollution, and in part it has a value because it was necessary to acquire it in that way.

Q. As a matter of fact, this farm was purchased for the pur-

106 pose of protecting that water to be impounded down there in that reservoir, wasn't it?

A. Well, that is one of its advantages, undoubtedly.

Q. And if it was purchased for that purpose, then when the reservoir became obsolete that use of the farm was also gone, wasn't it?

A. Yes.

Q. No. 18, Walter T. Bailey and wife, 41.88 acres. What particular use is that to the water company as a water proposition?

A. Well, that proposition is practically comparable to the other Bailey farm that we have just been speaking of.

Q. That was purchased largely, if not entirely, for the purpose of protecting the water impounded in this reservoir, wasn't it?

A. Well, I am not competent to say that; my information is it was purchased because it had to be purchased to get that spring.

Q. There is a spring on it?

A. It undoubtedly has a value as protecting that spring from pollution or accident, because it provides an environment which is under control.

Q. Another item I call your attention to on page 35, Honaker mill, reservoir, and dam, $3,500. Where is that property?

A. I am not fully informed as to all this past history, but the Honaker—so called Honaker mill, reservoir, and dam has the Ada spring in part on it, and the impounding reservoir is located on it, and I believe this impounding reservoir which we called
107 obsolete is also on it in part.

Q. Now, what else did you say was on it except that impounding reservoir that is obsolete?

A. The impounding reservoir for the spring out of which the pumping station supply is drawn is on this tract. Mr. McCarthy informs me that the spring itself is on this tract.

Q. There is a spring on this tract?

A. The Ada spring.

Mr. William McCarthy: The Ada spring.

Judge Ritz:

Q. Your report doesn't show that, does it?

Mr. McCarthy: Well, it is on it.

A. It doesn't seem to.

Judge Ritz:

Q. The report shows the spring on an entirely different tract, doesn't it?

A. It appears to.

Q. That is true, isn't it?

A. Yes, sir.

Q. Now, I notice on the inventory which you have filed, under tract of land, 56.15 acres, Calfee and R. H. Bailey, which lies contiguous to the 99.36 acres. What value is that tract of land as a water works proposition?

A. Where is that tract again, sir?

Q. The tract of land lying contiguous to the 99.36 acres called the 56.15 acres, Calfee and R. H. Bailey.
A. Where do you find this item?

Judge Sanders: On the report of values. What page is it?
108 A. Well, I have not looked on the report of values. I will see. To save time, I will say I don't think that is in our inventory.

Judge Ritz:

Q. I don't find anything on here that corresponds with it, unless it is this Ruble farm down here at the bottom of page 35.

Judge Sanders: That is different, Judge.

Judge Ritz:

Q. You have got a Ruble farm on here, valued at $500, 46.50 acres. Where is that?
A. You have got me helpless on these local names.

Judge Ritz: Well, I will get that from Mr. Mack. He is going on the stand, isn't he?
Judge Sanders: Oh, yes.
Judge Ritz: I will get all that from him.

Q. Now, Mr. Alvord, you have figured, as your first item of cost of reproduction, what you call preliminary cost, amounting to $14,455.
A. Yes, sir.
Q. That, I believe you state, is figured as 3 per cent of the value of the property?
A. It is my recollection it was 3 per cent on the physical items of the property.
Q. Yes, on the physical items. Well, that is all of the items except the $50,000 water right value, isn't it?
A. Yes, and going value and overhead charges.

Commissioner Northcott:

Q. Operating capital?
109 A. Operating capital.

Judge Ritz:

Q. Now, of that you figure 1 per cent is the cost of procuring the franchise?
A. No, I don't say that.
Q. How did you figure that 3 per cent?
A. I considered that engineering investigations for source of supply would be at least 1 per cent of that, or about $5,000; that the legal expenses for forming the company and negotiating with the city for contracts, for optioning real estate, acquisition of franchise would be at least about $5,000 more, and that the remainder would

be made up in the necessary expenses of the company, its organization, its officers, its clerical, accounting and traveling expenses in connection with the bringing of the project up to a point where building could begin.

Q. Now, this is all money to be expended in advance of the project being started at all?

A. Well, you can't say that. It is in advance of the project being put on a contractual basis with the city. The project is started when it is first conceived in the mind of the promoter.

Q. Well, it may be spiritually started then, but not physically?

(Witness laughs.)

Q. This is all, then, expense that is incurred before you physically begin the work?

A. Before you can say to the engineer "we have a con-
110 tract, go ahead and build the plant on the lines you figured in your preliminary work."

Q. In other words, this is expense which should be incurred before you can procure your franchise?

A. Yes, sir, it is the necessary condition you must be in before you can secure your franchise and know what you can contract for.

Q. This company has a perpetual franchise? That is your information?

A. Yes, sir.

Q. I don't know whether there is a copy in the record or not.

A. Yes, sir, there is a copy in the inventory.

Q. And if this franchise was secured without cost to the company then it did not, as a matter of fact, spend those items before securing the franchise, did it?

A. Oh, yes. There is a good many more important things there than getting the franchise. The very proposition as to how that franchise's terms are going to be made, both from an engineering and legal standpoint, must be thoroughly understood by any set of men proposing to furnish this city with a supply of water.

Q. Have you any information as to how much was paid for legal expenses and engineering expenses for the purpose of getting this franchise?

A. That doesn't concern me at all. I am talking about building this property today, in this city, today; I am not going into the historic past.

111 Q. You have no information on that, have you?

A. Not that I remember. I have made no investigation here as to the past cost of this property.

Q. Isn't that one of the ways of determining what the present value is?

A. It is if you have all the facts before you; and if the past cost is not recent past cost then past cost method of ascertaining the present value is not a reasonable method to apply.

Q. The cost of the franchise would be reasonable, taking into consideration the fact that it is a perpetual franchise, wouldn't it?

A. No, sir, because the historic conditions have all changed. This

is now a large town; the franchise here is a much more important matter than it was thirty years ago. The contractual relations are and would be very different from what they were thirty years ago.

Q. Is the company paying any more for it now than it did thirty years ago?

A. The company hasn't acquired franchise recently.

Q. Does it cost the company any more now to meet its obligations on account of the franchise then it did twenty years ago or thirty years ago, when it got it?

A. Why, yes, sir, it does, very much more.

Q. How much more?

A. I couldn't say, but thirty years ago all they had to do was to run a gravity line from the nearest spring that supplied the
112 whole town. Now they will probably have to go outside of the state for water.

Q. What did they pay for the franchise?

A. I don't know.

Q. As a matter of fact, if they agreed to put in a certain number of hydrants free of cost to the city, and have been doing that all the time, and that obligation is the same now as it was when the franchise was granted, then the obligation they made to the city is the same now as it was when the franchise was granted, isn't it?

A. So far as that goes, but that is not the cost of reproducing this franchise.

Q. Now, the additional cost of going outside of the state for water, you expect the company to be compensated for that, don't you?

A. I think so; yes.

Q. But the thing that you don't expect them to be compensated for is the free service they give the city for that franchise, and that is the same as it always was, isn't it?

A. No, I couldn't say that. The service they give now is worth very much more than it was thirty years ago.

Q. They are asking to be compensated for that additional expense, aren't they?

A. What has that to do with the franchise? The franchise is merely the right to do business in this town. I have not allowed any value to the franchise at all; I have only estimated the neces-
113 sary cost of negotiating it, on the assumption that there was a willing seller and a willing buyer, and all they needed was the time and attention and legal thought to get together. I have not placed any value on this franchise.

Q. You don't value the franchise as worth anything?

A. No, sir.

Q. But you figure that the $14,455 would be the amount reasonably expended in securing it?

A. Oh, no, not at all. That $14,000, only a very small portion of it has to do with the investigation necessary as to how the contractual relations can be sustained, how that water can be found and delivered to this community.

Q. Mr. Alvord, what would have to be done in order to spend this $14,455? What would you buy with it?

A. Well, my dear sir, if you had ever been through one of the

organizations of one of these companies, you would see that just these things that I have stated here have to be done.

Q. Now, you say engineering. What engineering would you have to do in order to make your application for a franchise?

A. Why, you would have to know absolutely in advance that you could supply water from some source to this town. I appreciate that most people think that these things are just a matter of guesswork, but they are not. I know of no company, or no capitalists—never have met any—who rushed into these things without spend-
114 ing a great deal of money to assure themselves just what they could do, how they could do it, what the facts were, in advance; all the investigations have to be made to assure themselves that they are not doing something that is foolish. That is the most necessary part of the expenditure of this company; there is not any dollar that is spent in this enterprise that is more necessary and more proper and more prudent than that amount that is expended.

Q. Can you be a little more specific than that and say just what is to be done with this $14,000?

A. If you will turn to page 33 of my valuation you will find the whole thing outlined there.

Judge Sanders:

Q. That is the valuation filed with your evidence?

A. Yes, sir.

Judge Ritz:

Q. I find a number of items here, but you don't say how much for each item.

A. Well, I explained that to you on direct examination. I will go over it again.

Q. My recollection is you said 1 per cent was for certain items, and you state that was not so.

A. You said 1 per cent for the franchise. I didn't say that. I did say that 1 per cent was for the engineering investigations, analyses and surveys which would enable the company to know where they could get water, how much it would cost them, and what it would cost them to deliver it. That, to my mind, is one of the most important things to be done before the company could
115 enter into contractual relations with this city. And I did say that I had looked over some eighteen examples where I had gone through that phase of the subject myself in companies that had been formed, and they averaged 1 per cent in eighteen cases, and I thought that 1 per cent was very conservative here, because the difficulties here are unusually great. I also said I thought another one per cent would be due for legal services in forming the company. The company must be organized, or the promoters must know how they are going to organize it, and enter into negotiations with the city for contractual relations on the assumption that there is a willing seller and a willing buyer, without assigning any portion of that expenditure to the value of the franchise as a franchise, simply the cost

of getting into the minds of the city authorities and getting into the minds of the company the precise mutual arrangement which they must enter into. You know, as a lawyer, just as well as I do that that takes a good deal of time, care, and attention, and is a slow educational process when you are dealing with a municipality; and I did say that there was a balance in my judgment which would be necessary for the expense of the company, their traveling expenses, their conferences with the city, their clerical expenses, their optioning of real estate, their negotiating for the necessary bond issues of capital required, and other like legitimate expenses which
116 they must know all about before they enter into contractual relations with the city.

Q. Now, those are the things that that $1,500 is for?

A. Yes, sir.

Q. And you don't know whether any of that was spent in this case, at all?

A. I am not interested at all in what is done in the past; when I enter into a reproduction estimate the past is a blank, unless it is some recent cost, or some particular item which will throw some light on what it would cost in the present.

Q. Now, you stated that 1 per cent, you thought, would be the amount necessary to organize the corporation?

A. Three per cent—— Oh! One per cent; yes, sir.

Q. For the purpose of organizing the corporation and procuring the franchise—that is, as you have stated it, getting the council and the water company in a frame of mind where they could agree. To whom would that $5,000 be paid?

A. Attorneys, like yourself.

Q. Then you think that attorneys would get $5,000 for procuring a franchise?

A. Not necessarily.

Q. Just wait till I get through. (Continuing:) Such as is in existence in this case, and for organizing such a corporation as we have here?

A. Not necessarily all of that for the legal expenses. There are plenty of legitimate expenses necessary to educate the public
117 and to educate yourself when you are going to contract with the public as to what type of franchise you are going to enter into.

Q. You have the type of contract you are going to enter into here. It wouldn't require 1 per cent for that?

A. I didn't say 1 per cent for that.

Q. Didn't you say 1 per cent was devoted to organization of the corporation and procuring the franchise—that is, getting the council and the company into the frame of mind where they could agree on it?

A. I didn't at any time say 1 per cent was applied to securing the franchise.

Q. I haven't said that either, have I?

A. You are leading in that direction.

Q. Didn't you say that 1 per cent was set apart by you for the purpose of organizing the corporation and procuring the franchise, and

that you meant by procuring the franchise not only the preparation of the papers, but getting the council and the company in mind to deal with each other?

A. No; I added a lot of other things. I said advising the company legally as to its organization——

Q. You say advising them in regard to its organization. I had that in, didn't I?

A. And advising them as to all their matters and their business and their relations to the state, the conduct of their business, their acquisition of money, and any legal advice which a company
118 stands in need of when it is being formed, which, as you know, enters into a great variety of important matters.

Q. That is all work of organization of the corporation, isn't it?

A. Yes, but that work of organization is largely legal. It includes a great deal more than getting the franchise, although that is an important element in it.

Q. How much would you pay for the organization of the corporation and how much to getting the public up to the point of granting the franchise?

A. Well, I wouldn't attempt to go into the details, because they vary so widely in every case; but I have never observed—This is not a reflection on the legal profession—I have never observed that the lawyers got less than the engineers.

Q. Now, Mr. Alvord, if this particular company procured its franchise and started its operation without incurring this preliminary cost, which you have put in here as, in round numbers, $15,000, they ought not to be entitled to receive the return on that money they have never spent?

A. Why, they certainly have. It is just as absolutely legitimate money spent as any money spent in securing this plant.

Q. I say, if they never spent it.

A. If they never spent it in the past it is no reason why they would not have to spend in now on a reproduction. We are getting at the value of a reproduction today.

119 Q. Then it is your idea that whether they spent this money or not they ought to get a return on it?

A. They surely had.

Q. Now, the real estate you say you know nothing about the values of that, but got that from other sources?

A. Yes, sir.

Q. The item of rights of way—how did you arrive at that valuation?

A. Well, that was taken largely from the actual costs to the company of the right of way, and certain things which had to be done in procuring such right of way to satisfy the owners.

Q. Did you base that on the amounts actually paid for these rights of way?

A. Yes, sir.

Q. Then these figures that you give here are in the main the amounts that were actually paid for the rights of way?

A. Yes, sir, in the absence of better information. It is proper to

say I hardly believe that those rights of way could be obtained at the present time for the amounts there enumerated.

Q. I notice you have on page 36 a right of way from H. B. Bailey and wife valued at $100. Where is that right of way, Mr. Alvord?

A. Page 36, you say?

Q. Yes.

A. What item are you looking at again?

Q. It is March 15, 1902, H. B Bailey and wife to Bluefield Water Works and Improvement Company, you valued at $100, on page 36.

120 A. My information is that that is on the 10-inch line from the Bailey spring—Beaver Pond spring, crossing Adams street.

Q. That is obsolete now, isn't it?

A. I don't understand it is. The pipe is in use.

Q. Hasn't that pipe been discontinued and laid in the street now?

A. I am not informed; it wasn't at the time this valuation was made.

Q. How about the Eliza Bailey valuation just above that? Where is that?

A. My information is that that is along the same line nearer town.

Q. Is that still in use?

A. It was in use at the time this valuation was made, to the best of my knowledge and belief.

Q. The last three items in that group are right of way on that same pipe line, aren't they?

A. I believe they are.

Q. Taking the items of rights of way there for the Beaver Pond spring, I wish you would state whether or not all of those rights of way are now in use by the company, or are they useful by the company, in view of the fact that that part of the town is laid out in streets?

A. They were at the time this valuation was made, and up to the last that I knew anything about the property.

Q. The next subdivision of this item is buildings and improvements. You have one frame cottage at the Beaver Pond

121 spring valued at $400. For what purpose is this cottage used?

A. Well, I am not informed what it is used for now. It was a cottage that was evidently bought with that property, I should imagine, and occupied possibly by the guardian or watchman or keeper there.

Q. That is the only use the company could have for it?

A. Evidently.

Q. Now, at the Ada station, how did you arrive at the value of $400 for that house?

A. Well, I relied—I made an estimate of the value of the house, but I have revised it down to its present worth very largely on the advice of real estate people here, and Mr. McCarthy's judgment and opinion, as I was not fully informed as to the value of such old houses.

Q. You calculated the original cost on the basis of its cubical contents, didn't you?

A. I presume likely; yes.

Q. You didn't value it item by item, so much for roof and *roof* much for weatherboarding and all those things?

A. Yes, sir. The difficulty I was under in valuing such old houses as that was to know how much depreciation, in the popular judgment, was put on them, and as to that matter I had to seek advice from people that knew more than I did about it

Q. Now, if you ascertained its first cost by taking the separate items that go to make up the house and valuing them, why did you calculate the cubical contents of it?

122 A. Well, that just gives an idea of the size of the house to anybody that is looking over the proposition.

Q. That was the only purpose of that?

A. Yes, sir.

Q. This three-room cottage at the Ada pumping station, valued at $350, what is that house used for?

A. I think the engineer or some of the men there occupy it.

Q. How did you arrive at the value of that house?

A. In the same manner as the item previous.

Q. You have a house on the Henry Bailey farm valued at $2,000. What is that house used for?

A. I don't know that I know.

Q. It is not of any value as a water works proposition at all, is it?

A. Unless it had to be acquired with the property, and unless it can be used for the keeper or the inspector of the springs.

Q. Well, it is not used for any such purpose as that, is it?

A. I don't know; I couldn't say as to that.

Q. The barn or crib on this property you value at $300. That hasn't any particular value as a waterworks proposition has it?

A. Except as it has to be acquired. You sometimes have to buy things for waterworks uses which after they are acquired do not have distinctly water works uses, but they must be held, must be kept, must be preserved, must be made to return revenue.

123 Q. Well, they ought to be rented, the same as any other property, oughtn't they?

A. For instance, we very frequently have to buy whole watersheds for reservoir purposes, and the farm houses frequently standing on them. Now, it is the part of prudence, and perfectly proper, to retain those houses and rent them so as to reduce the rates for water to the community.

Q. They are a separate proposition from the waterworks entirely?

A. No, they can't be separated from the waterworks, because you couldn't have acquired the property without acquiring them. If it was possible to sell them and move them off you could do that, but you can't be blamed for having acquired them if there was no other way to get it.

Q. You have got the fence on this farm valued at $1,050. That has no value as a waterworks proposition, has it?

A. Why, certainly. If you have to hold the property you want a fence around it.

Q. It has no value to the waterworks, has it?

A. Yes, sir, that protects it from people who might pollute the water accidentally, or wantonly or willfully.

Q. That could be done by fencing the spring, couldn't it?

A. I think not.

Q. It wouldn't be necessary to fence the farm?

A. Yes, sir, I think so. It shows that the property is being protected and cared for.

Q. You have, on page 49, a house and barn near Ada
124 spring. You value the house at $450 and the barn at $75.

Are those houses being used for the purposes of the company's business?

A. I couldn't say as to the present house. They may or may not be occupied by the company; but the same line of reasoning applies to any house necessary to the purchase with the property.

Q. You have a house at the Ruble farm valued at $600. This is the Jarrell spring, which I believe you say is the spring that is not useful to the water company as a water property?

A. Well, that item is not included in my final totals at all.

Q. The item of $600?

A. No, sir. I have it here in detail, but it is not included in the totals.

Commissioner Northcott:

Q. Is there anything on the report to show that it is not included?

A. Yes, sir; it is mentioned and then shown to have no value except as real estate.

Judge Ritz:

Q. Well, I notice your totals on page 42, buildings and improvements, are $11,001.75, and that includes that item of $600, and then your summary in the first part of this book, your total is $11,002 for buildings and improvements. When did you get at that $600?

A. Well, it is my impression that it was not included. I may be wrong. I may be wrong about that; it may have been included. It appears to be, as you say.

Q. That ought not to have been included, ought it?
125 A. Why, I think it had; yes, sir.

Q. That is in the same category as the Jarrell spring property?

A. I can't bring myself to believe that the company is not justified, having adopted the policy of buying these springs, in buying that Jarrell spring. There may be reasons why it may become very valuable to them, and, as I said yesterday in answer to the Commissioner's question, my own opinion is that they ought to go to larger sources of supply at this time, and if so, if I am right, then this lies in that twilight zone as to whether the judgment was good or bad, which may turn out either way. I may be wrong, and it may be very much needed, as I suggested this morning, for emergency purposes, pending the other supply; but it is water, and it is the

duty of this company to look ahead and provide and equipt itself with all the sources of water which it believes or has reason to believe are going to be useful to it; and in my opinion the benefit of the doubt along that line of investment should be given to the company, not against it.

Q. Well, what I asked, M. Alvord, was simply whether or not that was not in the same category as the Jarrell spring property. It is part of the Jarrell spring property?

A. It is part of the Jarrell spring property; yes sir.

Commissioner Northcott:

126 Q. Mr. Alvord, let me ask you, if you think it should be included, why were you under the impression that you had not included it?

A. Well, possibly I had not refreshed my mind as to the exact course that item should take, but I was under the impression, and still am, that somewhere I did not include water rights for the Jarrell spring property.

Q. I didn't catch that.

A. I am under the impression that I left out the water rights on the Jarrell spring property as not having any very great value that I could see.

Q. I am speaking of the house.

A. The house here is apparently included with the real estate.

Q. I say, if you think it should be included, why were you under the impression that you had not included it?

A. That I had not included it?

Q. Yes.

A. I say I am under the impression that somewhere I have depreciated that. I don't put my finger on that at this moment.

Q. You don't get my question, Mr. Alvord. If you think it should not be depreciated, why are you under the impression that you did depreciate it?

A. I don't know that I understand that. Will you read that question?

(Question read.)

A. If I should think it shouldn't be appreciated?

Judge Sanders: If you think it should not be depreciated.

The Witness: Why did I depreciate it?

127 Judge Sanders: Yes, that is the question, as I understand it.

A. Why, I think my opinion was, when I made this valuation, which you understand was made last year, that my opinion was that the water rights on that spring were hardly worth much in view of the necessity for going elsewhere for water.

Commissioner Northcott:

Q. Mr. Alvord, I am not talking about the water rights; I am talking about this particular house, this $600 item.

A. This particular house was bought with the piece of land, as I understand it, and the piece of land, as land, I have included in this estimate, as I remember it, depreciated on account of its age. This $600 is its present worth as marked here.

Q. Yes, but you stated a moment ago that it wasn't included in your total.

A. I think I am in error on that.

Q. You now say you think it should be included in that total?

A. Yes, I believe that real estate should be.

Q. If you are of the opinion now that it should be included, why were you under the impression that you had not included it?

A. Well, I wasn't—My mind wasn't fresh on what actually had been done by me with that item last year when I valued this property. I probably got confused as to what I did actually do. This valuation was made last year, and I have had to freshen up
128 my mind on all of these items, and there are a great many of them, and I presume I cannot fully recall now as to precisely what happened to each one of them at the time I made this estimate.

Commissioner Northcott: Pardon me for the interruption, Judge. Go ahead.

Judge Ritz: Yes, that is all right.

Q. Now, the next item, which is No. 3, the gravity springs, you have a present physical value for that item of $13,876. That represents the work that has been done on the springs, doesn't it, Mr. Alvord?

A. Yes, sir, I believe it does.

Q. And at page 43 and following, you have itemized that work?

A. Yes, sir.

Q. And the number of units and the value of each unit you have given as you fixed them in that itemized statement?

A. Yes, sir.

Q. All the way through.

(No answer.)

Q. Those unit values are pretty high, aren't they?

A. You mean relatively, or——

Q. Well, actually.

A. From one point of view they are pretty low.

Q. From what point of view are they low?

A. Well, if you had climbed up there to every one of those springs and seen the situation and location and environment and been offered the opportunity to do that work, I think you would
129 feel they were pretty low.

Q. Now, there is no item in here for climbing up to the springs. This is for doing the work?

A. Yes, that is in there all right—climbing up to the springs. It is in these unit prices. It is supposed to be. Whether there is enough in there or not, I am not so sure.

Q. You have got $50 for clearing a half an acre of brush and wood. Fifty dollars—don't you think that is a pretty good price for it?

A. No, I don't; I wouldn't take the contract for that myself.

Q. I understand that. Don't you think that is too much for it?

A. No, sir, I do not, as it was described to me by the men that actually did the work on the ground, barring the fact that they had to climb up the mountain every day to their work, that they had to carry their supplies on their backs, and that the mountainside is a mass of debris, rock, brush, especially in these ravines or draws where the springs occur.

Q. You have infiltration lines, 20 lineal feet of vitrified tile in a 4-inch rock trench, at $2.25 a foot.

A. Will you kindly give me the page?

Q. That is on page 43. Do you mean by that that that trench is dug out of the rock that that is laid in?

A. It is dug out of a mass of debris such as I have just described, stuff that has tumbled down from the top of the mountain
130 and lodged there, built up a mass of broken rock and logs and all sorts of debris that comes down with the torrents that rush down a mountain there after a storm.

Q. It is not cut out of the solid rock at all?

A. No, I don't think it is.

Q. Now, does that $2.25 a foot include the cost of laying the pipe and the pipe too?

A. Yes, sir.

Q. Well, don't you think that is a pretty big unit price for laying a tile under such circumstances as that, $45 for twenty feet of it?

A. No, I don't. I have taken pains to go up to every one of these springs with the men who did this work, and have a description from them as to what was done and saw with my own eyes what they had to meet; and I don't believe this is really high enough. If I should change it I should be inclined to raise it rather than lower it.

Q. I notice on this same page, under the head of "head house," you have 1.7 cubic yards of concrete in basis at $20 a cubic yard. Don't you think that it is pretty high for concrete?

A. Not in that location. I have known concrete that cost $40 a yard; some concrete I know of has cost $100 a yard.

Q. Don't you think you could take a wagon and haul material and take materials for concrete and haul it to the top of East River Mountain for less than $20?

131 A. No, sir, I don't think so. No wagon can get to this place. The cement and sand and gravel had to be carried up on men's backs.

Q. They got the stone there, didn't they?

A. I suppose they broke the stone up there. Usually you run stone through a rock crusher. This had to be broken with a sledge hammer.

Q. It doesn't take long to break up enough stone for that, does it?

A. It takes considerable time.

Q. How far would you have to carry the sand and cement?

A. Well, I would be more or less making a guess at that, but certainly 2,000 to 3,000 feet, in some cases.

Q. In this particular case I am talking about, where this 1.7 cubic yards of concrete was used in the basin.

A. Well, I couldn't identify that particular spot now. Speaking generally, the smaller quantities of concrete you have to place the more your concrete costs you, and unless it is right down close to your base of supplies; and the more inaccessible it is and the more difficult it is to get your material the more it is going to cost you.

Q. How much cement would it take to make 1.7 yards of concrete?

A. Well, it would take a couple of barrels.

Q. How much sand would it take?

A. It would take one yard and a half.

Q. How much rock would it take?

132 A. It would take 1.7 yards.

Q. Of Rock?

A. Yes.

Q. And you would only have 1.7 yards when you got through?

A. No, that is right; that is right. The cement and the sand goes into the spaces between the rock, and the cement goes into the space between the sand, so what appears to you to be an oddity is really so.

Q. It would take 1.7 yards for each of these things?

A. Yes.

Q. And you would only have 1.7 yards of all when they are put together?

A. That is so.

Q. You never put an equal amount of sand and cement and rock?

A. No, it is about twice as much sand as cement.

Q. And about twice as much rock as sand?

A. Yes, sir, but the rock has to be the full cubic contents of the fully quantity of concrete, and the gravel and sand goes into the spaces between the rock. When I spoke of a yard of rock I meant a yard of rock, broken, crushed, which has spaces between it, and you fill those spaces with the sand and gravel, and you fill the spaces between the sand and gravel with cement, so what appears to be three or four times the material all goes into one cubic yard.

Q. You take the space of a cubic yard, and you fill that clear full of rock?

A. Yes, sir.

Q. And you take another space of a cubic yard and fill

133 that with sand?

A. No.

Q. And put that with the rock and still have one cubic yard of both?

A. No. If you had been paying close attention to me you would have heard I didn't say that. I said a yard and a half of sand.

Q. How much cement?

A. About a barrel and a half. But you have got to carry up there more of all those materials than you actually use. You have got to have a little left over.

Q. What do you want it left over for?

A. Because you can't underestimate your quantity and then not finish your job and let it set. Of course, this is all kindergarten, but I am glad to instruct you about making concrete.

Q. I don't doubt that. You said about a barrel and a half of cement. How much would that be in yards?

A. I don't know. It is enough cement to fill up the interstices of the sand and gravel.

Q. Now, the next item,—you don't seem to make much progress on that——

A. No. I hope you are learning, though.

Q. No, I am not. (Continuing:)—is $40,000 for the water rights at the gravity springs. This is in addition to the values you put upon them as real estate.

A. Yes, sir.

Q. And in addition to the values you put upon the build-
134 ings on them?

A. Yes, sir.

Q. In other words, you have departed from your theory of physical valuation when you get to this item, haven't you?

A. All my theory of physical valuation is based upon reduplication, and this water right is based upon reduplication.

Q. And you figure, to get these springs now, if the water company didn't already have them, would cost $40,000 more than they did when they did get them?

A. No, I don't say that. I think it would cost a good deal more than that to get them now.

Q. Then you have departed from your theory of reduplication?

A. No, because I never reduplicate a thing *on* the most expensive way to reduplicate it. The most expensive way would be to consider what you would have to pay those greedy farmers up there, who think springs are gold mines. The least expensive way to reduplicate that water at the height where we use it is the next nearest most available supply.

Q. Yes, and that would be $40,000 more than the cost of these springs?

A. Well, that would show us that the next nearest available supply to where we use it would cost us more than the amount of the real estate and development of this water by $40,000.

Q. In other words, if these springs were not here, then Bluefield would have to pay $40,000 more to get water than it does
135 have to pay?

A. That is it.

Q. And the water company should have a return because Bluefield is favorably located toward these springs?

A. No, that is not my theory. My theory is this, that this company having exercised its prudence in behalf of the citizens of this city, secured by cautious negotiation these springs—they probably couldn't buy them together today for two or three times the amount—they are entitled to something for their prudence, their skill, and their confidence in acquiring these springs, and that amount is measured by the cost of the next nearest available supply.

Q. Well, isn't it the duty of a public service corporation to exercise prudence and caution in the management of its plant?

A. It certainly is.

Q. Then why should they be paid an extra compensation for that?

A. Because prudence and skill are not common attributes of human nature.

Q. Then you capitalize this company's prudence and skill at $40,000 for having secured those springs?

A. I do. I believe that having seen that is a valuable supply, and that they would cost three or four times today what any other supply would cost, they secured that for the people of this city at very much less than they could be bought for now, and they got the benefit of that prudence, and saved to the city, by reason of it,

136 the amount that would be asked for those springs today over and above the amount of that. There is a very large margin in there where they saved money to the citizens of Bluefield. I don't mean to be interpreted as saying that there is no limit to the value of those springs; there is a limit to the value of them. I think a great many people up there on the mountain have got altogether exaggerated notions of the value of those springs. They are asking unheard of and ridiculous prices for them, because they have an idea that the people of this city can't get water anywhere else; that they have got to have those springs and pay any price they ask for them. I think they are mistaken.

Q. You think in some instances the company has paid too much for these springs, don't you?

A. Well, it is just possible some springs have gone dry earlier than the company really expected they would.

Q. And those springs that have gone dry you still put in here and ask for a return on them, don't you?

A. No, sir; I apportion that on the total quantity of the minimum flow of all those springs. I have deducted those springs that have gone dry.

Q. Where they have bought a spring and the spring has gone dry and is of no use, you have still valued the real estate, haven't you?

A. No, I have not. All of the springs are producing something. Some of them are producing a very small amount of water.

Q. The Ada spring, you have an item of water rights

137 in there. That is on the same theory that you value the water rights for the gravity springs, isn't it?

A. Yes, sir.

Q. On the theory that you can get water cheaper at Ada than anywhere else?

A. That was the next nearest available supply after the gravity springs were exceeded—after the demand exceeded the gravity springs.

Q. I called your attention this morning to the statement contained in this report which you filed as preliminary estimates for water supply, on page 10, where it is stated that the cost per million gallons from the Ada spring is $84.70, and to the statement

on page 7 where it is stated that the cost per million gallons from your proposed Bluestone supply was $71.75. In view of those statements contained in this report, do you still say that the Ada spring proposition has a value as a water right in excess of the Bluestone proposition?

A. Yes, because it lay along the line of development, and was the next nearest available supply at that time.

Q. How far is it from Bluefield?

A. Well, it is four or five miles.

Q. And how far did you say the Bluestone supply was?

A. About six miles.

Commissioner Northcott:

Q. Which Bluestone supply do you refer to now, the limestone or the shale?

A. The shale.

138 Q. You based your figures on the limestone, didn't you?

A. Yes, sir.

Q. How far is that?

A. It is about four miles.

Q. A less distance, then, than the Ada?

A. Yes.

Commissioner Northcott: Pardon me, Judge.

Judge Ritz: Yes, I am glad you got that in.

Q. Well, now, I will jump an item or two, because I want to get over here to—I call your attention to item No. 40, Mr. Alvord, which seems to be covered in two statements, cutting pavement over cast iron mains, $28,846, and, B, cutting pavement over cast iron mains, $1,839. Why was that distributed in two items?

A. Well, one is on cast iron mains and the other is excavation on galvanized iron mains.

Q. That is a G instead of a C in one case, I see. I read them both as C. Well, as a matter of fact, when these mains were laid the pavement wasn't cut at all?

A. I don't imagine it was; no, sir.

Q. There wasn't any pavement cut then?

A. No, sir.

Q. And this item of about $30,000 was never expended by the company at all?

A. I don't imagine it was. There are a lot of things that were never expended by the company that are included in the reproduction estimate.

Q. Yes, I understand that. But just the fact that the city spends money in paving its streets over where a water main is, according to your ideas, should impose a burden on the city to pay

139 the water company additional rates?

A. No.

Q. Wouldn't that be the effect of it?

A. No, it simply makes an added value to all the property in this vicinity, including the water pipes of the water company. Water

pipes are always more valuable under a pavement than they are in an open road. A water distribution system is more valuable in a community that is all paved than it is in a community that is not paved.

Q. Now, I say, wouldn't the effect of the paving of a street which had a water main laid in it, if your theory is correct, be to make the city pay additional water rates because the city had paved the streets?

A. Why, I presume that would be the effect of it. So would be the effect of anything which goes to the improvement of the city. Every time you lay down a street car crossing across a pavement it increases the cost of the maintenance of these pipe lines, you understand, to have them under pavements.

Q. But that is a question that comes under maintenance.

A. Yes, but it is always an increasing cost, from a great variety of reasons, to supply water to a large, populous, and improved community than it is over a small village.

Q. The effect of that would be every time the citizens
140 spend money to improve their property they would have to pay the water company interest on the money they spend to improve their own property?

A. I don't look at it that way. Just as fast as the city gets prosperous enough and populous enough to have street car lines and pavements and other pipes and a great variety of police regulations and traffic, so they increase the value of these works, because if the reproduction is a measure of value—If the reproduction is not a measure of value—and it is not always a measure of value—then the works are not increased always by the new pavement, so it doesn't always hold, as you say, that building a new pavement increases the water rates; it only increases the water rates if reproduction, logically carried out—not dodged or wishes away—then the measure of value increases with the difficulty of reproducing it.

Q. I am talking about this particular case. You make your report in this particular case that there should be this $30,000 go in there, because of that street pavement.

A. Yes, sir.

Q. The effect of that is that because the city has spent money improving streets the citizens of the town and the city have got to pay the water company interest on that money that they spent themselves?

A. Yes, sir.

Q. If reproduction is a measure of value?

A. Yes, sir.

141 Q. And you think it is?

A. I do in this case.

Q. The Supreme Court of the United States repudiated that theory?

A. The Supreme Court of the United States got mixed up.

Q. They have repudiated that theory?

A. I don't think they have. I think they will reverse it when it is properly presented to them. The Supreme Court of the United

States decided that income tax was unconstitutional once, but they had more light on it later.

Q. You have got that reversed; they first decided it was constitutional and they later decided it was unconstitutional.

A. I am satisfied in my own mind that the Supreme Court did not have that matter properly presented to them, because no honest engineer, and I will include Mr. Miller sitting right there, will admit that we can reproduce a property without cutting through a pavement unless by some possibility there is an opportunity to put a pipe in a parkway. The Supreme Court can't escape from that. In trying to get away from the paradox you put up a while ago, not seeing the reason for it, getting themselves mixed up with historic cost, which has no place in reproduction estimates, they, in my opinion, went astray on this subject, and will, when it is properly presented to them, correct their rules.

Q. You don't say that reproduction is the only element to be considered in rate making?

142 A. I say there are times when reproduction gives a proper and adequate measure of the value of a property. That doesn't always exist. There are times when reproduction is not a measure; when other things will vitiate it. There are times when past cost becomes a good measure of the value of a property, and those times occur when past cost of a whole property is very recent. To illustrate that, I have just valued a property in York, Pennsylvania, which was a hundred years old, and the past cost of that property, which consisted of wooden pipes and hollow log pipes, two systems which have passed away, the actual *pst* cost of that property was 50 per cent more than its reproduction price. Evidently the past cost wasn't any measure of value on that property. At the same time I was valuing a property around the environs of St. Louis which had all been built up and completed eight years previous, and there wasn't any better evidence, in that case, provided the work was needed and the services were needed by the consumer—there wasn't any better evidence than past cost, with a few changes to bring it down to present value. The cases in which past cost is the best evidence are very few, and the cases in which reproduction cost is the best evidence are very many.

Commissioner Northcott:

Q. Mr. Alvord, aren't there other elements that ought to be considered aside from these two?

143 A. Oh, yes, sir. You want to get all the elements you can. I almost never make a valuation without looking into a whole lot of other things. For instance, I want to know how this works as a whole, when I have got them valued, compares with other works, and if I find it is more expensive than other works in cities of the same size I want to know the reason why. If there is a good reason why I am satisfied. If I find it is only worth half of what works in other communities are worth, I want to know the reason why, and if I can't find the reason why I begin to look around and see whether my own figuring is correct. Then there is

the question of the prosperity and the growth of the community. The works in some communities are worth a great deal more than reproduction because the community is a live community and going ahead, and the property is bound to grow with the community. Another community exactly like it in which reproduction would be the same might be standing still. You would naturally pay something more for the plant in the community which is growing, therefore that plant is worth something more than it would cost to reproduce it; the other plant is not worth as much. There is a great deal of reasoning to be gone through with after you get through with all those detailed reproduction estimates. The trouble is so many people get blinded by all those matters of detail that they forget to go through the general reasoning after they get through to see
144 whether or not their conclusions are justified.

Q. In your opinion, should any weight be given to the value of the stocks and bonds of the company?

A. In certain cases, where a representative market for those stocks and bonds is found. In a case of large utilities in large cities, those stocks and bonds are actively traded in, and they do give you a good clue to what the investing public think is the future value of that property; but in some communities, like this, or the majority of utilities that we have to deal with, there is no active market for such securities, and they are not much known outside of the local community, and therefore they are of less value—the market prices are—than would otherwise be the case. But there is one reservation I want to make on this. Even in those larger utilities where the stocks are actively traded in, the price that is paid for those stocks and bonds is usually more based on the hope of the investor for the future than upon any precise analysis that he makes of the actual condition of the property at the present time. Consequently, they should be taken with some reservation, in my opinion.

Q. In your opinion, should any weight be given to the amount of actual investment expended?

A. Where it can be known I always like to know it if the books have been accurately kept from the beginning I always like to
145 know it, but always with this caution, that there are always expenditures and costs which do not get on the cash record; but I view that kind of evidence always with the feeling that that past cost, whatever it is, has all got to be reduced to the present cost by a process of going through a thousand and one considerations for every detail which makes it almost impossible to use it. For instance, the cast iron pipe costs a great deal more or a great deal less than it does today. You have got to reduce that to today's prices. Money cost a great deal more years ago than it does today.

Q. You mean you have got to reduce that down to reproduction-new value?

A. You have got to analyze what this property cost today from what it cost in the past. If you analyze it correctly, and you are super-human, you might arrive at a resolution which would be near what the reproduction estimate would be, but in my experience that is more than any of us are able to legitimately and intelligently

do. But when your past cost is recent past cost, so that it comes within the ken of those operating, then it becomes of more and more value to you in forming your opinion on value.

Q. In the case of excessive profits earned in the past, do you think any allowance could be made for profits earned in the past, if there was any such, in arriving at a rate making value?

146 A. I don't see how the state, or the community, can go back into the past histories of all these utilities and compensate those that have suffered and fine those that have made money. It would be an almost impossible task; I don't think the courts ever contemplated it. I don't think as a physical possibility we can do it justly, and I think we have got to let the past go. We have got to take these properties as they exist today; we have got to get an edequate conception of their necessity to the community, because they all depend on the need of the community; and we have got to adjust them gradually; we can't adjust them all at once. Some of them that need raising we can't raise all at once, because in a town like this it has got to be gradually raised. We can gradually adjust them to their value, their environment, and their need to the community.

Q. In a growing town, with good prospects for the future, in your opinion should the company be compensated fully as of the present, or should the prospects for the future be taken into consideration? In other words, should the potential value be figures?

A. I don't believe so, because that future involves regulation just as much as the present; and we always have this fact, that in a growing town the return increases a little faster than the population. That is about the only practical way in which utilities commissions find they can really raise rates, is to let the properties alone

147 and let them grow up to their proper return, if they are growing and there is any evidence that they will grow to their proper return. As a matter of public policy, the people will not stand for any tremendous raise in the rates in any utility that they were once used to certain rates for, and we have got to meet that situation; but that is the only way in which the commissions have been able to practically raise rates. Here and there they have had the courage to raise them, in extreme cases, like this one. The Wisconsin commission have done it; other commissions have done it; and there come times when they have to do it; but the great portion of the raise which can be accomplished, for instance, the proper payment of this fire protection in this town, in my opinion, ought to be accomplished by a gradual raise in the amount that the town pays every year; not all at once, because you probably couldn't put it through to put it onto them all in one year, but gradually increasing every year the town ought to pay more for this fire service. If they don't they can't have it; that is all there is about it; there will be a time when this company will go to the wall, because you can't entice capital into a non-paying institution, and Bluefield has certainly got a very difficult water proposition up before it—one of the most difficult I know anything about anywhere.

148 Q. In the matter of the fire rate you speak of, in your opinion what should be done where the estimate as to the

proper amount that should be paid by the city for fire protection comes in contact with the tax rate as fixed by state law, which tax rate, in many instances, is not large enough to permit of the payment of the proportion that is technically figured out for fire protection?

A. In that case I suppose all the alternative is to have the town pay all that tax rate will permit, and have the balance go on the consumers, as it does now.

Q. In your opinion, with regard to this particular case, should any consideration be given to anything except the reproduction-new-less-depreciation theory?

A. Well, we haven't got very much else to go on. The plant is not a recently built plant; its early history is all mixed up with land operations here, so that we can't seem to get an analysis of the investment; and even if we did, from my point of view, that investment would have to be analyzed in a way that I don't think would be possible. And it seems to me that if this community needs this property and the service that it gives, and if this property has been fairly and intelligently installed and operated, and if the service is worth to the consumer what they have to pay for it, or what they will have to pay for it, which means, of course, can they go anywhere else and do any better, it seems to me that those
149 fundamental conditions exist; this property is certainly worth what it would cost to rebuild it if it was suddenly wiped out today and we didn't have it.

Q. Do you think in this instance any consideration should be given to any other value than that of reproduction-new-less-depreciation?

A. Oh, yes, sir; I would say that we ought to consider the special environment here, the difficulties of the water supply, the growth of the city, and particularly the question as to what the service is worth to the consumer; in other words, can he go anywhere else and do any better? On the basis of my estimate, this property has already cost more per capita than the average plant in the United States, and that is very easily seen to be because of the peculiar difficulties; they have to go away out of town in this rough country and get water; but even that extra cost does not and has not given them a proper supply; and eventually, in my opinion, this city will have to pay—whether it does it itself or does it through the agency of a utility; it doesn't make a bit of difference to the reasoning—it will have to pay more both in first cost and in operating expenses than probably double the average city in the United States to get its water. Now, that is a situation which can't be helped; it must be met, and we can't reason it out of existence; and the money for it must be forthcoming, whether the city operate it or whether the company induce the capital to go into it.

150 Q. Mr. Alvord, if it should be the fact that this company was started in connection with a real estate proposition, and that real estate proposition had been very profitable, in your opinion should that be taken into consideration?

A. No, sir. The value of this property lies wholly in the future;

it is only worth something because it is going to serve a need in the future, that is yet to come; and on the whole question of this reproduction we eliminate everything that we think is not going to be valuable in the future, because it is the future need that makes this property valuable. Its ability to grow and develop and supply that future need is the whole foundation of its value. If it hasn't got the ability to supply that future need it is not worth anything.

Q. Reverting to the reproduction theory, can you conceive of a community of this size that would have a water plant put in new, and that hasn't had one gradually built up from the beginning of the town?

A. Oh, yes; we have built ourselves, here two years ago, a new plant—practically a new plant—in La Crosse, Wisconsin—new all but the distribution system. There is the city of New Orleans, a city of about 300,000 people, built an entire new plant in 1909. They had no water supply there before that time except from cisterns on the roofs and a little fire protection system down in the business district; and while it is not common, it doesn't fre-
151 quently happen, for instance, it does happen often enough to enable us to know what we have to do. I built the plant in Gary for the United States Steel Corporation. Gary jumped into 15,000 population the first year, and is now about 45,000 population. We foresaw all that and built a plant for it when there wasn't a house there.

Q. You didn't have to dig up any paved streets, did you?

A. No, but when there are no paved streets there is not much revenue. The paved streets are evidences of prosperity, which is a foundation for revenue.

NOTE.—At this point, it being 12:30 o'clock p. m., a recess was taken until 2 o'clock p. m. of the same day, at which time this hearing was resumed as follows:

Judge Ritz:

Q. Mr. Alvord, I call your attention to the item No. 44, services, unusual excavation, cutting pavement, $24,395. As I understand, there is included in this item the value of the service connections from the company's main to the consumers, and in addition to the actual value of the pipes and work of putting them in, there is included the expense of putting them in if the streets had been paved where they are now paved. Am I correct about that?

A. Yes, sir.

Q. As a matter of fact, these service pipes were all put in
152 before the streets were paved, were they not?

A. Well, I don't suppose all of them were, but I suppose the great bulk of them were.

Q. The great bulk of them. And you say, I believe, that since 1908 your information is that the company didn't put in any of them up until the time this inventory was made?

A. I believe so; yes, sir.

Q. Well, prior to 1908 there was practically no street paving in the town. Isn't that true?

A. I don't believe there was much.

Q. So that any of these service connections that were put in by the company prior to 1908 were not placed under paved streets?

A. No, sir.

Q. Now, what part of that item is for the services that were put in by the company prior to 1908?

A. Well, I don't know that I could state. I hadn't intended to separate it here. I wouldn't be able, without Mr. McCarthy giving me the number of services that were in existence prior to 1908, and he can probably do that better than I can when he gets on the stand.

Commissioner Northcott: Let me get this straight in my mind now. As I understood Mr. Alvord's testimony, it was in 1908 that the company began the custom of making the consumer pay for the connection?

A. Yes, sir.

Q. Up until a year ago?

A. Yes, sir.

153 Q. Then from 1908 till 1915, roughly speaking, the consumer did pay for them?

A. Yes, sir.

Mr. William McCarthy: In Part. We furnished the corporation cock and drilled the main.

Judge Ritz: By the corporation cock you mean the cock that connects the service pipe with the main?

Mr. McCarthy: Yes, sir.

Judge Ritz:

Q. Could you say, Mr. Alvord, what part of this item is charged for the expense of cutting pavements?

A. Yes, I think that is separated here, in page 118, headed, "cutting through pavement over service pipe". That is a part of the unusual excavation.

Q. That item, I believe, amounts to $5,978.50. That is correct, isn't it?

A. Yes, sir, cost new.

Q. Then of the item of $24,395 to which I have referred, $5,978.50 is for the expense of cutting through paving?

A. Yes, sir.

Q. The remainder of it is the cost of the pipes and the expense of laying them?

A. Yes, sir.

Q. How many service connections has the company, or did the company have at the time you made this inventory, rather?

A. They had 2,234 live services at that time.

Q. How did you figure the cost of these service connections?

A. Well, that is shown on page 117. It shows different sized services and the cost per each size and the number of each size.

154 Q. You figured the respective sizes at a uniform price, I notice, and did not undertake to ascertain what the actual cost would be to put in each pipe?

A. No, I figured each—each case I figured the details of that elsewhere. I haven't put all the details in this statement, because they are very—a good deal of it; but I figured the detail, galvanized pipe and the corporation cock, goose neck, curb cock, curb box, got the laying, and all that, and I figured that out and the result for that type of service has been used here as the unit price.

Q. And you applied that to all the pipe?

A. Yes, sir.

Q. You didn't undertake to take each service separately and estimate the cost of it?

A. No, sir.

Q. I notice you have an item, Mr. Alvord, No. 53, engineering and superintending. I believe you stated that was for the expenses of engineering and superintendence during the construction of the plant?

A. Yes, sir.

Q. And that is in addition to the $15,000 of preliminary engineering?

A. Yes, sir.

Q. Well, how did you arrive at that?

A. That is taken as 5 per cent on the items No. 3 to 52, inclusive, which are physical property items.

Q. Well, you have the next item administrative and legal costs. What is that made up of?

155 A. Well, that includes the cost of the company's expenses during the year while the construction is under way, the salaries of the officers, and accounting, legal advice again, and rent and office expenses during the period of its construction.

Q. Then the $15,000 and $22,000 and $9,000, *is* round numbers about $46,000 so far, for preparatory expense, so to speak?

A. Yes, for the brains of the institution.

Q. $46,000 to furnish brains to start it with?

A. Yes, sir.

Q. Then you have got another item, general contingent costs, at $17,920, in round numbers $18,000. What is that for?

A. Well, that represents the fact that it is not humanly possible to take any plant and rebuild it twice and meet the same conditions, even if you know exactly what you are going to do, and had built this plant—just built it—and were going to build it over again, you would not meet the same conditions, because the proposition is in large part one dealing with the human element, as well as mathematics and physics. Therefore we always have to allow something for that which is unknown—can't be prophesied.

Q. Isn't it possible that you might have more favorable conditions than you anticipated?

A. That once in a while happens, but it surprises us so
156 when it does happen that we never forget it afterwards. Ninety-nine times out of a hundred it is the other way. You perhaps appreciate that if you ever built a house.

Q. You make the estimates as carefully as you can, and after you make that estimate you estimate that you have missed it so much?

A. Well, I wouldn't like to put it in that unpleasant phraseology. If it wasn't for the human element—if we were dealing with so many pounds of iron and brick, I think we could make closer estimates of what it would cost, but when you come to deal with contractors and laborers and accidents and all sorts of things which depend on the state of society around, we are dealing with something which we cannot absolutely prognosticate, and we find from experience that after we have figured all the known things, the things which we can definitely see, we have got to allow a margin for the unknown things which may come along—strikes, floods, hazardous foundations—things which we can't foresee.

Q. You figure that about 3 per cent?

A. I figure it is about 4 per cent. Usuallly, in any new work, I would take that at 8 or 10 per cent, but having a pretty definite plant before us, pretty fully described, I have cut that in half.

Q. Now, of course, if you had what you call the historical
157 value of this plant you could tell just exactly what the cost was without any contingency?

A. Oh, no, the books wouldn't show that at all. The contractor, like your house contractor, might have gone broke. The books wouldn't show that. The losses to the contractor are oftentimes a proper part of the costs of the plant. He can't be a very experienced contractor. That is part of the costs of the plant under those conditions.

Q. Assuming that you knew what the plant might have actually cost, whoever might have spent it, your element of contingencies would be eliminated?

A. Yes, you would know pretty well what it would have cost under the then existing conditions.

Q. You have an item of interest under construction, I believe you figured this plant would be under construction and you would be deriving no revenue from it for something like a year, and you figured the interest on the value of the physical properties during that time?

A. Yes, sir.

Q. As a matter of fact, most of the physical properties in this plant, the larger part of them, were put in while the plant was in operation and they were deriving revenue from it?

A. Yes, sir, of course, they derived no revenues from it during the time they were constructing it. Historically, they must
158 have lost some revenue on it during the time they were constructing it. That wouldn't show on the book.

Q. That wouldn't equal the interest on the whole cost of the plant for a year?

A. No. Still, I would think it would aggregate about as much as

if it had been built altogether. As a matter of fact, it is possible that a building built altogether, and hurried—hustled through—might be a little better off, as far as that is concerned.

Q. Suppose, though, that by putting in these separate units you required one month to put in one, we will say we would only be losing the interest on the money invested in that for one month. Isn't that true?

A. Yes.

Q. But if you take the plant as a whole you would be losing the interest on that for a whole year?

A. Yes, but every separate part would have its loss of interest, no matter what time it took to build it, just the same when it is all built together as if it had been built in piece-meal. The only difference is when you are building a plant altogether you get some parts built a little before they can be used, before other parts are built; and a prudent, skillful engineer tries to get his parts so built that they all come out about even for work.

Q. To illustrate what I was driving at, suppose this plant
159 was constructed in the beginning, and it cost $100,000, and it took a year to construct it and get it in operation, you would lose the interest on the $100,000?

A. You would only lose about half the interest; you wouldn't have the money all in the whole year.

Q. Well, whatever time you had it in?

A. Yes.

Q. Suppose you wanted to put in another tank that cost $50,000, and it would take a month to construct that tank.

A. Yes.

Q. You would only lose the interest for one month on that tank?

A. Yes, sir.

Q. If you lose the interest on the plant for $100,000 for a whole year, you would calculate for the whole year?

A. If I understand you, yes; but if that tank was built when the rest of the plant was built, it would still have gotten its one month's loss of interest. In other words, you can't change the definite time which it takes to construct a thing because it is all constructed together or constructed in piece-meal.

Q. What do you mean by the going concern value, Mr. Alvord, item 57?

A. Well, that is the cost of financing this property into the possession of its income.

Q. Then that is another sort of a brain item, in addition to the $46,000 that you talked about a while ago?

A. No, no, this is a real—this is the real thing; this is real expenditure. Brains—The going value is just as necessary to the in-
stallation of the property as the *h*ypes of the pumps, and if
160 it is neglected, or if anybody thinks they can wish it away, they generally have some very sad experiences. For instance, if this city had no plant here and were going to build its plant, it would have to wait till the plant was completed before it could even begin to take on consumers, and then it would have to gradually ac-

quire those consumers, at first those who were most prosperous and anxious for water, and later on those houses where they had other supplies and were not so anxious, and finally the outlying outskirts of the very poorer classes of people, who are very slow to acquire such facilities.

Q. Then that is the expense of procuring the business?

A. Well, it is the advantage which a plant which is already going—operating—and has its income has over one which has got to begin to install a physical property.

Q. Well, now, haven't you accounted for all of this when you have calculated interest on the money invested for the time it is under construction, and calculated for all these contingencies?

A. Now, we make an allowance for the interest in the going value, so that it doesn't come in twice.

Q. This is really not an expenditure of money at all?

A. Oh, yes, it is; it is an actual expenditure of cash. Not all of the advantage of this plant appears in cash, but it would appear in a concrete case, if you can imagine such a thing as the city
161 of Bluefield saying that they won't have the service of this plant any more, but they will build their own plant, they will actually lose any cash that this plant is deriving during the year that they were building their plant, and they would actually lose a portion of the revenues beyond that this plant is deriving from its consumers during the time they were building up their business, and that would be an actual cash loss.

Q. But they wouldn't be paying out any money?

A. Yes, but it would be a loss just the same.

Q. That is calculated to represent the money which they didn't get which they might have gotten if something else had happened?

A. Yes; it is an advantage which a going property has over one that has got to be reproduced.

Judge Sanders:

Q. And that goes in to make up the value?

A. Yes, sir, like any other reproduction. You have got to reproduce the business as well as the physical property.

Judge Ritz:

Q. Mr. Alvord, reverting to the item of preliminary costs that we talked about this morning, you based your estimates of preliminary cost of $15,000 on 3 per cent of the amount invested?

A. Yes, sir.

Q. Does the question of preliminary cost have any relation to the value of the plant, necessarily?

A. Well, it doesn't vary directly as the cost of the plant, and we don't always use the same percentage, for that reason. In a
162 small plant the preliminary expenses are rather larger in proportion to the physical property than they are in larger plants; but in some kinds of utility they are greater in proportion than they are in other kinds of utility. I have used 2½ per cent

quite frequently in larger plants than this, and my reason for using the 3 per cent in this plant is that it is relatively a small plant, and the cost of getting it into contractual relations, and in addition to that the difficulties of properly determining how you shall supply a meet those contractual relations, are, in my opinion, unusually large in this plant.

Q. And that accounts for this large amount which you have allowed for that?

A. Yes, sir.

Q. Do you think, Mr. Alvord, that it would be reasonable for a man or any set of men to spend $15,000 to determine the advisability of constructing a water plant in a city the size of Bluefield and in procuring the franchise for it?

A. Well, I admit that they are under a hazard in making that expenditure up to the time that they get into contractual relations, and many times they lose a great deal of their expenditure because they never succeed in acquiring the contractual relations which will justify it. That is one of the hazards of the business.

Q. Do you think in the case we have here, with these mountains and springs from which this water supply is taken, that there would be any necessity for expending money for expert engineer-

163 ing advice?

A. I do.

Q. In advance of obtaining the franchise?

A. Yes, sir. I am advising the present company, if this proceeding results in proper return, to make a very exhaustive and thorough engineering investigation as to four or five different possible sources of water supply—an investigation that will be accompanied with surveys and tests, and will, as far as possible, reduce all guessing to a minimum, so that they can see what is the best direction to increase the further capital that must be expended for the water supply to Bluefield.

Q. That wouldn't be necessarily so when those additional supplies were not required for the water supply of the city?

A. I understand, but it is necessary to do it now.

Q. It is necessary to do it now when the needs of the city have grown beyond the present supply?

A. Yes, sir.

Q. But was that necessary thirty years ago?

A. Yes, sir. It is my understanding that it was actually done; that they had a very good engineer that reported on the whole subject, even when they first considered the gravity springs, when it seemed a very small matter.

Q. Did he spend $5,000 in doing that?

A. I don't know.

Q. Mr. Alvord, I believe you stated that with this project of impounding water on Bluestone you would provide an 18-inch main from this reservoir to the twin tanks?

164 A. It is 16. That was my recollection.

Q. What would be the capacity of a 16-inch pipe?

A. Well, the best of my recollection is that that was figured to

take 2,000,000 gallons four miles away with a reasonable loss of head——

Q. Well, the capacity of the pipe would be very much more than that, wouldn't it?

A. Not with a reasonable loss of head.

Q. What do you mean by a reasonable loss of head?

A. Well, you have to pump the water up a certain height, which is all lost, due to the friction inside of the pipe itself, and one of your economic objects is to keep your pipe of such a size that your operating expenses are not unduly increased by excessive friction losses; and while a smaller pipe than that would carry the water, it would carry it at such an excessive friction loss that your annual cost of operation would be excessive and wasteful.

Q. Well now, how much water would you expect, under the conditions that exist here, to carry through that pipe?

A. Why, at all ordinary times, and in the first years of the addition, you might be carrying, for the domestic supply alone, possibly a half a million gallons in addition to the other supply, up to a million gallons at such times as the other supplies were at a low ebb. Should there be any conflagration, however, you would expect to put through a very considerably greater quantity,
165 depending on the call of the fire department for water for the extinguishment of fire.

Q. So far as domestic service is concerned, then, a pipe very much smaller than that would answer the purpose?

A. Oh, yes, sir, a very *small* smaller water works than this would answer if we only had the domestic service to consider.

I might say here that I think the people of Bluefield would use more water if the mains were extended and additional takers were taken on, which should be taken on, and that with the acquisition of a source like this I believe that the amount delivered would materially increase.

Q. Consequently, the revenues of the company would increase?

A. Yes, sir, the revenues would increase, unquestionably.

Q. If all of the inhabitants of the city were supplied with water now, the revenues of the company would be substantially greater?

A. There can't be any question about that.

Q. Mr. Alvord, you spoke this morning about the capacity of the Ada spring at its minimum. The maximum capacity of this spring is very much more than that, isn't it?

A. Oh, it is a tremendous amount gr-ater.

Q. Ten times as much, isn't it?

A. I should say yes, so I am informed; it comes out there like a torrent.

Q. Why, with the dams and impounding places already
166 provided, could not excess water be impounded at the Ada springs and kept there for such emergencies?

A. That is just what the company proposed to do, and the city refused to let them. They built that reservoir down there to impound the surplus waters of that stream and hold it for use, and the city objected to that.

Q. That was without filtration?

A. Yes, sir.

Q. Why couldn't that be provided with a filtration plant such as you propose on Bluestone and meet all reasonable requirements for the next twenty-five years?

A. Well, it could be provided with filtration, but it would not meet all the requirements for the next twenty-five years. In the first place, there was a good deal of difficulty found in impounding water just at that site. There is a limestone formation there, and it wasn't easily retained. In the second place, there is not the opportunity for storage there to carry a considerable quantity of the wet season water over to the dry season; and as for filtration, I feel sure that the Ada springs water, in time, will have to be filtered in any event.

Q. So that with the present plant they have got and the additional filtration plant, which will have to come in any event, they could impound that excess water down there and keep it for dry times?

A. They could undoubtedly impound some water down there.

Q. Well, if the maximum capacity of that spring is ten
167 times its minimum capacity, you could impound plenty of water there in wet weather?

A. No, you can't impound more water than you have square miles of water shed. We only have a few square miles of water shed there, I don't think more than two, maybe one and a half. On Bluestone we have seventeen. You can't get water enough onto the watershed of Ada springs to produce 2,000,000 gallons a day from the surplus waters.

Q. Couldn't you buy more land?

A. Well, God's rain doesn't fall on more land. It only falls on this land from the top of East River Mountain down to the spring. Of course, we don't know precisely where those limits are, but they are not very extensive. We know approximately.

Q. Your idea is that the amount of water that comes out of that spring is controlled by the amount of land over it?

A. Yes, sir, the amount of land that collects in that spring per square mile.

Q. Well, how much water could be impounded from that shed?

A. Well, it would be very hard to say, without going into it carefully. Possibly a half a million gallons.

Q. You mean that a half a million gallons would be all the——

A. No; I mean enough water to supply half a million gallons a day during the dry season.

Q. Yes. In addition to the regular minimum supply?

A. Yes. Now, that is a pure guess. I haven't any date to establish that on.

168 Judge Ritz: Unless we have omitted something, that is all. We may want to recall Mr. Alvord.

The Witness: I would like to present, as well as that paper on hydrant rentals and apportionment, the other paper in which I have analyzed this question of the cost of cutting through pavements.

Judge Sanders: Well, I would be glad if you would file that as a part of your evidence, marked in some way to identify it.

The Witness: It is called, "The Appellate Court of New York and the Question of Paving over Mains," and I have taken the opinion of the Appellate Court of New York and discussed it.

Judge Sanders: Will you please file this paper, then, marked, "Discussion of the Opinion of the Appellate Court"?

The Witness: I will.

NOTE.—The paper referred to was later filed as evidence, marked as requested, and is hereto appended.

Judge Ritz:

Q. Did you refer the opinion of the Supreme Court of the United States?

A. No. The Appellate Court of New York, in the Kings County Lighting case, within a few days delivered an opinion on the paving question as well, in which they got mixed up between present cost and past cost; and they delivered themselves of an opinion, which enabled me to see just how they reasoned, and it was very clear that they were thinking about past cost and talking about
169 reproduction cost, and I tried to point that out in this paper.

Judge Sanders:

Q. Have you made a discussion of the opinion that you refer to of the United States Supreme Court?

A. No, sir.

Q. It is of the New York Supreme Court?

A. It is the same question, of course.

Q. But your discussion is of the opinion of the New York Supreme Court?

A. New York Appellate Court.

Q. New York Appellate Court. Well, will you file this discussion of yours, marked "Discussion of the Opinion of the Appellate Court"?

A. Yes.

Redirect examination.

Judge Sanders:

Q. Mr. Alvord, speaking of impounding the water in East River spring, you say you could impound half a million gallons. You mean yearly?

A. That I could impound enough water—It is possible that an investigation might disclose that you could impound enough water to add perhaps a half a million gallons a day to the dry weather flow of that spring, but I won't be sure on that without a more detailed investigation.

Q. Well, what would be the cost of making this impounding?

A. Well, I think it would be very great, because I think that is a

limestone country up there, and it is going to be very difficult to get a tight reservoir.

Q. Could you give us an approximation of the cost?

170 A. No, I could not. I haven't got in my mind whether there is reservoir capacity up there enough in those abrupt hills to do it anyway. That is one of the things, however, which I believe should be looked into and exhaustively investigated, what can be done to add to the present sources of supply. That doesn't look, from the study I have made of it, that you will get near as much from your money from that as you will to go to Bluestone. Now, a detailed investigation might prove that I am not right about that, but that detailed investigation ought to be made.

Q. You say that it will be necessary to in-tall a purifying filtration system if this water should be impounded. What would be the cost of this filtration system?

A. Well, it would cost about twenty or twenty-five thousand dollars.

Q. You further say that your opinion is that within a *year* years it will be necessary to filter the water from East River spring?

A. Ada.

Q. How much would that system cost?

A. The Ada spring?

Q. Yes, Ada spring instead of East River spring.

A. Well, I had that in mind, but to put a filter plant up there at all you would want to filter all of that water, I think.

Q. Well, independently of the question of impounding the

171 water, suppose you wanted to install a system to filter the water from Ada spring, what would that system cost, not taking into account the filtration of the water impounded?

A. Well, I should think possibly it would be wise to install filtration there up to a million and a half, perhaps two million gallons.

Q. Daily?

A. Daily, yes. Because the highest demands for fire protection must be filtered, of course, as well as the domestic supply.

Q. You have been interrogated as to the capacity of these various springs, of which you have given an approximation, I believe. In some instance maybe you have given it by actual measurement, have you?

A. Yes, sir, my assistant, Mr. Luce, has actually measured all of the springs.

Q. That is as to the minimum and average quantities, not as to the maximum?

A. Well, as to the minimum particularly. He couldn't determine the average with very great accuracy, and couldn't determine the maximum at all.

Q. Yes, that is what I understood. Now, in making these measurements and calculations, it was of the entire flow from the springs, and did not take into consideration the rights of lower riparian owners? What I mean to say is, your calculation wasn't predicated on the amount of water that the company would be permitted to take

172 from these springs, but, on the other hand, it gave the actual flow of water?

A. Yes, sir. Many springs have a reservation on the part of some owner lower down for a certain amount of water out of the spring.

Q. Now, the Beaver Pond spring, which I believe is the largest spring, the company is only permitted to acquire from that spring the surplus water? Isn't that true?

A. Yes, sir.

Q. Under the decision of the United States District Court and the Circuit Court of Appeals?

A. So I am informed; yes, sir.

Q. And what that surplus water will be, do you know?

A. No, I couldn't say at this time.

Q. And that can't be ascertained, can it?

A. No, sir.

Q. Because it depends on the development and the uses of the lower riparian owners, doesn't it?

A. Well, it would require a long series of measurements, extending over a period of years, to determine what that was.

Q. And, of course, it would require the permission of the lower riparian owners?

A. Yes, sir.

Q. In the acquisition of this Beaver Pond spring the company spent a large sum of money in litigation, didn't it?

A. I believe it did.

Q. You don't know, however, that amount?

A. No.

Q. Speaking of the going value which you have estimated,
173 you and Mr. Miller are nearly together on that sum, aren't you?

A. Yes, sir. Almost precisely together.

Q. How is that?

A. We are almost precisely together.

Q. Do you know the exact difference between your and his figures for that item?

A. Well, it is too close to be true (laughing). I mean to say by that that it is closer than the data would warrant. The data doesn't warrant such real exactness in our——

Q. Of course, the reports will show, but I——

A. Mr. Miller's is $16,302 and mine is $16,328. Well, if we had agreed within five or eight hundred dollars I would consider that that was as close as the data upon which the computations are made would really warrant.

Q. I believe you stated that in estimating the preliminary cost you did not include any sum for the acquiring of the franchise?

A. No, sir, no sum as a value of the franchise per se.

Q. That is what I mean. The franchise, or right to furnish the city with water, taken at the time when it was, would very materially differ in value with what it would cost today, wouldn't it?

A. I should think so; yes, sir. It is usually the case that a franchise in a large town is more strictly guarded and less liberal than a franchise—early franchise in some of these very small places.

Q. Well, at the time this franchise was acquired, I believe,
174 was probably in 1890, or probably would be in 1891, or about that time. The population of Bluefield was very small at that time?

A. It must have been.

Q. It is now about 15,000—so estimated, isn't it?

A. Yes, sir.

Q. Of course, you don't know what would be the value of the franchise today?

A. No, sir, I wouldn't—I wouldn't quite know how to go into that in West Virginia without looking up some of your laws and precedents. In other states where utility commissions regulate a fair return, we don't consider that the franchise has any value in itself, because the return is to be predicated upon the property used and useful, and there is no real surplus of earnings left to predicate any franchise value on.

Q. And therefore, in estimating your values, you have not included the franchise as of any value per se?

A. No, sir.

Commissioner Northcott:

Q. Mr. Alvord, in your opinion is it a fair item of value to be taken into consideration for rate making purposes?

A. I don't think so. The franchise, of course, is an absolutely necessary prerequisite to contractual relation, but all the contractual relations are predicated on the cost of the services and the need of the supply and a fair return for serving the supply; and there is nothing left in our modern conception of utility regulation which
175 could be applicable to a return on a franchise value, even if you found there was a franchise value. Some States in which I have valued properties have, for some reason or other, exceptions to that rule, but very few. In Mississippi there is an exception to that rule that I don't quite understand legally, but which permits you to value a franchise.

Q. Have they a state commission, public utilities or public service commission in Mississippi?

A. No, sir. I have never been particularly interested to look up the legal reason for that, but there are two United States Supreme Court decisions, I understand, in the Vicksburg case in which that point was settled for that state; but almost all of the other states—every one of them, as I recall it—the law is such that utility commission regulation reduces the return to the property used and useful.

Q. In your opinion, Mr. Alvord, is there, or can there be, or should there be, more than one standard of value, for instance, a standard for rate making purposes and a standard for condemnation or sale purpose, or any other purpose?

A. I can't conceive of there being, for any independent purpose of that kind, more than one standard of value.

Q. How about the standard for taxation?

A. Well, there may be a difference there, because the law
176 prescribes that it shall be a fair cash value, and that at once creates a condition which predicates, I suppose, a more or less forced sale, and therefore reduces it down to a sort of a junk value, if I might add it, but that is fully due to the fact that the law steps in and predicates something on which your value must be taken into consideration.

Q. Isn't your estimate in this case upon a fair cash value of the cost of reproduction?

A. Well, not in the sense of selling out the physical property as so much physical property. My value is predicated upon its being a going, working whole, and having a relation to the future need, and not subject to immediate sale

Q. What leads you to believe, Mr. Alvord, that the fair cash value fixed by law in West Virginia for taxation purposes is synonymous or means the same thing as a forced sale value?

A. Well, I don't know anything about West Virginia law. I only know that in some other states, my own, for instance, there is a description of the value for property which I have been informed contemplates that kind of a value; and when the assessor comes around he will assess my household property, for instance, he puts on what I would call a forced sale value, a sort of a junk value. I never object to it. I wouldn't sell my property for that, because it is useful to me, but that is the scale upon which he assesses all household property in my neighborhood.

177 Q. Presuming that the law in West Virginia is that there shall be a fair and actual value fixed for taxation purposes, in your opinion, then, should there be any difference between the taxation value and the rate making value?

A. No, not if the law doesn't limit that in any way, simply points out that the fair value of the property should be found; and I would consider that that stood in the same category as value for rates, value for sale, value for taxation, or any other purpose. And my thought is this, that if the property is, by any stretch of the imagination, worth one thing for sale and another thing for the making of rates, which is going to be the higher value of the two. The lower value will be the value at which the buyer wants to buy; and it is inconceivable that a property could pass, or its value could be reckoned, as one value at one time and another value at the same time. I can see how values can be made greater or made less by loss at different times—operating at different times—but I can't see how any property, whether it is for rate making purposes or for sale, can have two different values at the same time.

Q. Well, is it or is it not true that the courts are making a distinction in that respect, as far as rate making values are considered?

A. As far as I have studied the decisions, I don't think they
178 have. I think that what has led to a little misconception on that point is this: In rate cases the courts are endeavoring to determine whether property has been confiscated. There are not interested in the true value so much as they are interested in

determining whether there has been confiscation; therefore, in a good many cases, they have determined what they call the least value, or the minimum value, which would tell them whether there was any possibility of confiscation. In condemnation cases, or in cases for transfer, the court doesn't look at it that way. The law looks at it as finding the fair value as between a willing seller and a willing buyer. There is the little point which I think has led some people to think that there have been two values at the same time. I don't think that the truth warrants thinking that.

Q. Well, is it or is it not true that a number of commissions have held that there should be a different standard of value for different purposes?

A. Well, we have all kinds of opinions from these new commissions, and some of it is good and some of it I don't think it is.

Q. You are familiar with some opinions that do hold that, aren't you?

A. How is that?

Commissioner Northcott: Read the question. (Read.)

A. Yes, I think I recall a number of cases where commissions have taken that stand.

Judge Sanders.

Q. What do you mean, that they have adopted two different standards of value?

179 A. They specify that for rate making purposes their values will be so and so.

Commissioner Northcott: And certain items are not allowed for rate making purposes that might be allowed for other purposes.

The Witness: Yes, sir.

Judge Sanders:

Q. Now, Mr. Alvord, for tax purposes would you or not be controlled in determining the value of the property by the returns the property yields?

A. Well, I might. I take into consideration——

Q. Well, would that not necessarily be one of the things which determined the value of the property?

A. Yes, as far as the returns——

Q. The net returns?

A. The net returns, as far as they work into going value, affect slightly the value of the property. If the return is not at all commensurate, it may affect the value a good deal. A property, however, which is having a normal return, part of the value is the value predicated upon that return—a small part of it.

Q. Well, as a sale value, doesn't the question of returns from the property enter very largely into it?

A. It does as between an independent seller, who is merely looking at it as an investment, and is not trying to analyze its true value in relation to the needs of the community.

Q. Well, assuming now that the returns to this company
180 on the property that is invoiced here is only 3 to 4 per cent, what would you consider the value of this property as compared with its value if the rate was increased to eight or ten per cent?

A. Well,—From the standpoint, you mean, of an individual buyer.

Q. The sale value of the property and the taxable value of it?

A. The value of the property is really predicated on what the commission is going to allow it to earn in the future.

Q. That is what I am trying to get at.

A. If the commission, for instance, wouldn't allow it to earn anything, the property is not worth anything.

Q. It is worth nothing as a selling proposition?

A. Yes. And the commissions, of course, are analyzing this whole proposition on what the value of the property is in relation to the needs of the community for its service, and they find a value predicated upon that need and the cost of supplying it and to adjust a fair return. Now, as far as an individual buyer's coming along who wants to invest his money in a paying institution, his point of view is wholly at the mercy of what the commission will do. If he finds a property in which the commission have not allowed very much of a return, why he won't buy the property; if he finds they have allowed a fair return, he probably may invest in that property; if he finds they have been liberal, he will be glad to invest in that property.

181 Q. Well, assuming that you had purchased this property at a cost of $500,000, and assuming further that it was paying you 3½ per cent annually, would you list it for taxation at $500,000?

A. No, no; and I wouldn't buy it as an investor for $500,000; but if I found on analysis that the city needed it, and if it didn't have this particular property it would have to build one just like it for $500,000, I would say the property was worth to the city, either for need or for sale, $500,000, and the commission ought to recognize that fact.

Q. Then, as I say, the valuing of this property for sale or for the purposes of taxation would depend largely on the earnings of the property, wouldn't it?

A. Yes, sir.

Q. And, of course, that would depend largely on what the commission allows for fixed rates?

A. Yes, sir.

Commissioner Northcott:

Q. Then, if you were valuing this property for taxation, as I understand you, you would take its earning capacity?

A. Well, I would take its present condition; and as far as the investor is concerned at the present time it is a poor investment——

Q. I don't think you caught my question. I am talking about taxing values.

A. Well, for taxing values I am not particularly familiar with the Virginia law on that.

Q. Well, I just understood you to say that if it cost $500,000 and was earning 3½ per cent you would not return
182 it at $500,000 for taxation purposes?

A. No, I don't think I could.

Q. Then you would measure its value for taxation purposes by its net return?

A. To a large extent.

Q. But in fixing it for rate making values you would use the reproduction-new-less-depreciation value?

A. Well, when I make the reproduction value I come to the proposition of the value of that property——

Q. I know, but the yard stick you would use is the reproduction value?

A. Yes, sir.

Q. Then you think there ought to be two yard sticks, one for taxation purposes and one for rate making purposes?

A. Well, I can't say that precisely either, because in my opinion, if there is no reason why the law does discriminate, I don't think anybody else ought to discriminate; and the commission ought to adjust that rate so that it is just and fair, and the taxation, if there is nothing to prevent, ought to be based on that. Of course, this whole question of taxation is taking money out of one pocket and putting it into another.

Q. The whole question I am trying to get at, is, if only one value, why two yard sticks to measure it with?

A. Well, there shouldn't be, only the condition that this property is only earning three or four per cent now, supposedly suggested by Judge Sanders, is, in my opinion, a temporary condition,
183 and should be adjusted, and does not really affect the intrinsic value.

Q. Then why shouldn't you return it at its intrinsic value for taxation purposes, if the law says it shall be assessed at its actual value?

A. I believe it ought to be but for the reason that we have no assurance, till the commission acts, that the value will be what it ought to be.

Q. If a man has a very fine thoroughbred race horse that cost a thousand dollars that he keeps for pleasure purposes, and he has a draft horse that cost a hundred dollars, and that horse earns him $4 a day, would you measure the value of those horses by their returns?

A. I would, because the money he is investing in the race horse is for the pleasure he is getting out of it.

Q. Then, if there is value in this plant, or should be, because the application has not been made for authority to charge a rate which would give a proper return, should that affect the taxation value, if that value is there?

A. Well, I don't know that it should, except that we have a situation that the city is getting something for nothing, the value is not expressed in the return that is being made, and the investors are obliged to invest their own capital to make good depreciation as well. Now, apparently an injustice is being done, and the property is not expressing itself in the fair return that it ought to have, because, as I reason it out, the community needs this property, must have its services, and would have to reduplicate it if it did not exist.
184 It may be that temporarily that value is not expressed, is not within grasp, but the intrinsic value which rests in the needs of this community is there, and must make, in any relation between the invester and the community, must govern the determination of the true intrinsic value.

Q. As to rate making purposes?

A. Yes, sir, or sale purposes.

Q. How about taxation purposes?

A. Well, I think that is there for taxation purposes, theoretically.

Commissioner Northcott: Pardon me, Judge. Go ahead.

Judge Sanders: That is all right.

Mr. Fox:

Q. Mr. Alvord, will this property, at the present rate charged for water, ever, by the increase of new subscribers, get an adequate return on their property?

A. I think it will be a very long, long race, because they can't get additional revenue without getting additional water; and they have got to the point now where they can't, in my opinion, as I see it now, get additional water without making a jump to some considerably distant and expensive source of supply; so that they are in position where just as soon as they almost get up to paying on the present property they have got to invest for the future again and they are put away back in the race; and I don't see any prospect of their catching up, because this is a peculiarly
185 difficult situation; this is a specially difficult place to provide with water, and water is going to cost this population probably twice as much as the average cost of water in the United States. The water around this -ummit is going to have very much more value as time goes on, even the water impounded in wet weather.

Q. Then additional subscribers will necessitate the outlay of additional capital?

A. Yes, sir, and a very great investment just at this time.

Q. Well, is the present rate of return sufficient to induce capital in the outlay necessary to create these improvements?

A. Not at all. It would turn it away. An examination, even of the valuation put on by my friend Mr. Miller, would turn capital away from this enterprise as an investing proposition.

Q. We have made reference here before to the sale and market value of bonds. Would bonds under the present rate be an attractive proposition to capital under any circumstances at the present rate?

A. No, sir. The only possible sale for such securities would be the

feeling on the part of the investor that the Public Service Commission of this state will come to the rescue of this property, the knowledge that it has got to be either perpetuated and preserved or it will go to ruin.

Judge Sanders:

Q. You have described, in a general way, the reasons for
186 the increased value of water at this point as compared with other towns and cities. I wish you would explain that more in detail.

A. Well, it arises from the elevation of Bluefield on this divide, the highest point—highest railroad point, anywhere around here. In fact, the more water you need the further and the lower down you have got to go after it. Also the fact that in this limestone country it is very difficult to impound it, very difficult to develop it, and it naturally seeks a lower level through the crevices and gets away from you. Then the pollution problem has to be dealt with. That complicates the situation. The pollution of Bluefield, the pollution of Graham, the necessity for emptying the pollution in some form into these rivers, either treated or untreated, makes it more difficult. What should be done in this state, as well as in a great many other states, there should be a conservation commission for these natural waters, because they are going, in time, to be very, very valuable, sewage disposal as well as water supply, and they have got to be first conserved for the benefit of the public; and in this district, as I see it, the public are going to need all the water that can be found around here within a reasonable distance within the very near future.

Q. Judge Ritz, in his examination, asked you that if it became necessary to impound the water on the Bluestone, and the
187 company did that, whether or not it would be necessary to continue the expense of bringing the water from the various springs referred to.

A. Well, certainly——

Q. I don't know that I understand fully your explanation of that matter, and I would like for you to explain it.

A. Certainly the gravity springs are always going to be the most valuable of any water, due to their elevation and their nearness to the population. The Ada springs could be developed to a greater value, perhaps, than they have now by being led to town, in part by gravity and in part by pumping, not flowing down into the Ada pumping station and then pumping up again. At present that appears to be more expensive than is necessary. The great spring at Ada is always going to be valuable, and increasingly so, due to the general growing use of water. Whether it will have a greater value than the Bluestone or a less value than the Bluestone it is probably difficult to say at this time without a more exhaustive investigation; but my feeling is that it is not depreciated by the possibilities of getting Bluestone water, for we have in the Ada development conditions a completed development; we know all about it; we know just what it costs to run it, and what the difficulties are to overcome; and when we come to

compare that with a projected development on the Bluestone we are as yet dealing with a project in which probably the con-
188 tingencies may not be already provided for; so I feel that the water is worth now what it cost, the city certainly needing it, and they need more than is at present available, and that it is the important problem now to settle as to where is the next best available source to add to what we have already got. I wouldn't be in position to answer that question with finality and with certainty until I had made an exhaustive study and report on all of the available sources of supply and the cost of development. I have only taken the Bluestone because as far as I can see from a preliminary standpoint that appears to me to be the most available, and it is at least the one in which we can know something about what we have to do to develop.

Judge Sanders: Well, that is all.

Commissioner Northcott:

Q. Mr. Alvord, in your opinion, would the Commission be justified, in fixing the rate of return which this company is entitled to earn upon the property used for the public service, in taking into consideration prospective moneys that might have to be expended in making improvements in advance of the expenditure of such money?

A. Yes. If I were——

Judge Sanders: Do I understand you to say to meet present demands?

Commissioner Northcott: No, money that may be expended in the future.

189 Judge Sanders: To meet future development?

Commissioner Northcott: Yes.

A. A commission, or permanent regulating body, has this advantage over a court in such matters, that they can continually exercise a watchful guardianship over matters which they settle. Now, to be very frank, if I were to indicate what I thought to be desirable procedure here, it would be to recognize the present property rather liberally with a rate which will certainly compensate what has been invested here properly for water supply, and then direct, if the commission finds that this city is not fully supplied with water, that it proceed to the investigation of other sources of supply and adopt one, which, in the opinion of the commission, after careful engineering investigation, will be practicable, and then await such future action as the commission see fit to take, the commission only looking at it from the standpoint of protecting the public's interest in seeing that adequate and careful steps are taken to increase the supply. Then, when the procedure has been outlined and the additional capital necessary is known finally, the commission, in the future, can take such action on petition or otherwise as will meet the additional investment necessary. In other words, we don't have to guess now what that future investment will have to be.

Q. Have you ever known of a commission that did allow
190 a return upon a prospective investment in the future?

A. Why, it seems to me I recall several cases where commissions have found certain things had to be done and have allowed on it. I myself was on a commission of three members at Freeport which was charged with the duty of finding what had to be done to bring the plant up to proper capacity, what the proper rates ought to be on that capacity, and giving the city the privilege of either buying the plant in its present condition, or extending its franchise under those rates which we determine. Now, that presented pretty much every question to us which had to be settled. We determined the amount that we thought the owners of the plant ought to expend to rehabilitate that property. We then determined the rates which would support that increased investment, and in so doing we also determined the value at which the city might purchase immediately, if they so desired, and the city had the option either to purchase or to continue at those rates, and the company was under the obligation, if it was granted the continuance of the franchise, of putting in those improvements, which were specified in detail.

Q. Did you allow the rate to go into effect before the improvements were made?

A. Yes, sir.

Q. At once?

A. The improvements were all such that they could be put in in one season, and the rates could be changed as soon as the city decided to extend the franchise. The rates were subject to revision
191 every five years.

Q. What would have been done if the company had extended its rates and the improvements hadn't been made?

A. The company wouldn't have lived up to the obligation, and the city wouldn't have had to pay the increased rates.

Q. How about the consumer, paying monthly?

A. Well, in that case we raised most of the increased rates from the city for improved fire protection.

Q. In your opinion, then, that is good practice, to allow rates upon prospective expenditure?

A. With the contractual relation, or, in this case, the order of the commission, that such improvements should be made.

Q. You think the commission is in position upon the data that has been presented to order any particular, specific action to be taken?

A. No, I think they are only in position to order that a proper investigation be made which shall determine—Now, such procedure as that has been taken quite often by commissions. Several cases in which we have been making an investigation lately, the investigation was directly on the order of the commission. The Indiana commission recently order- the the East Chicago plant to investigate and report to them the cost of a filtration plant and the rates necessary to support it, which we have done for them.

Q. Then, as I understand you, and in order that I may
192 not misunderstand you, the commission could not, upon the data presented in this case, base its action as to rates upon a prospective expenditure that may have to be made by this company to secure an additional supply?

A. No, I wouldn't suggest that, because that looks into the future I should think at least two years. It will be a question of two years, in my opinion, to make the investigation to decide what shall be done here, and to build the necessary works to add an abundant supply to this city, and I think that is ample time for the matter to be turned over again. The commission can find the value of the property at this time; they can adjust, if they find it necessary to do so, the rate liberally to the property now existing, and they can order—place an order that it seems to them to be apparent additional supplies are need. I think they would be justified in that. I think there will be further evidence presented here along that line. In fact, I may say, without violating any confidence, that one of the first things in this matter that came to me was a proposition to make this investigation; and I myself suggested that it be postponed until the attitude of the commission and the public could be ascertained, and on the basis of the new capital within the next two years the commission could review their finding and the additional expenditure and the necessary, proper supporting rate. In other words, you are not limited, as is a court, to just what is on this one
193 case before you, but you have a continuing opportunity to act in *adjustment* the investment to the needs of the community.

Commissioner Northcott: That is all.

Judge Sanders:

Q. Well, Mr. Alvord, what about a condition, if such exists, that the company is not now situated so as to furnish an adequate water supply?

A. Well——

Q. Existing conditions is what I mean, not conditions that arise in the future, prospective, problematical questions, but assuming that the questions are today such that the company is not so equipped as to furnish an adequate water supply to the city.

A. Well, I think such conditions already exist.

Q. Well, I say now, assuming that condition to exist, what would you say ought to be done?

A. Well, I am very sure that permanent improvements, such as I have suggested, must be made, or, if they are not made very promptly, temporary and more expensive expedients must be adopted which will tide this community over certain dry seasons all right that are apt to occur, that have been found to be embarrassing, and of the two courses of course I believe in more thorough investigation and the adoption of more permanent means of meeting this demand.

Q. Well, assuming that the company hasn't the money to do it

with, and assuming that the returns on the capital invested
194 are not enough to enable them to make sale of bonds for the purpose of raising the money, and will not enable them to raise it in any other way——

A. That is the reason why I suggest, in putting the rate on the present value, the commission will do well to make it rather liberal than otherwise, in view of the fact that still further and large investments must be made, and the subject must be further reviewed.

Q. Don't you feel that if it could be shown at present a certain amount of money must be expended in order to meet the present demands of the city, that that ought to be taken into consideration in fixing the rates?

A. Yes, I think that would be entirely practicable. Some sum which would represent the nearest piece meal addition to the supply might not be improperly taken into consideration.

Q. Well, what could you say about a sliding scale—an ascending sliding scale in regard to regulating the amount that should be paid for fire protection as compared with the amount paid by the consumer. I noted that you referred to a sliding scale in your answer to Mr. Northcott's question there a while ago.

A. Well, my feeling would be that you can't violently change the public payment for fire protection without very seriously embarrassing the authorities in the financial condition of this city,
195 and that it is wise to do that gradually, so that they may gradually adjust themselves to it; and in this Freeport case, where we had the same problem in hand, we adjusted it in five year ascending amounts each year, so that at the end of the five years the city would be paying much more nearly the proportion than they had been.

Q. You mean that you increased the amount that the city was to pay for fire protection each year?

A. Each year until they had gotten it up to a percentage which we felt was more nearly just.

Commissioner Northcott:

Q. In that case, did you make them pay their full percentage?

Judge Sanders:

Q. At the end of the five years.

A. I don't think I did. I think we got as near to it as we could; we felt we couldn't reach the theoretical proposition, but we got so much nearer to it than they had been paying that it certain- did equalize the adjustment to a very large extent.

Recross-examination:

Judge Ritz:

Q. Mr. Alvord, you are familiar with the receipts of the plant here, are you not, from water rates?

A. Yes, sir, I have tables showing the——

Q. I believe you stated the gross receipts of this company were about $40,000?
A. They were for that year.

Judge Sanders:

Q. What year was that?
A. That was 1914.

196 Judge Ritz:

Q. What, in your judgment, should have been the gross receipts for that year in order to yield the company a fair return on the capital invested?
A. I think you are placing me in the attitude of the court.
Q. I just want to get your idea of it. I don't propose to be bound by it at all.
A. On the theory that I have just expressed, that this company is facing a very large expenditure, I certainly would not place the fair return at less than 8 per cent just at this time, with 1 per cent additional for depreciation.

Judge Sanders:

Q. You mean 8 per cent net?
A. Eight per cent net.
Q. Profit to the company?
A. Yes.

Judge Ritz:

Q. In addition to the operating expenses?
A. Yes.

Judge Sanders:

Q. And then I believe you say you would add to that 1 per cent for depreciation?
A. Yes, sir.
Q. Which would make 9 per cent?
A. Yes, sir.

Judge Ritz:

Q. Well, that 1 per cent, that is to amortize the plant at the end of a hundred years?
A. Yes, sir.
Q. Well, what would that amount to, Mr. Alvord?
A. Pretty near double the present rates.
Q. You would have to have about $80,000?
A. Yes, sir.
197 Q. (Continuing:) You think, to do that?
A. Yes, sir. And I should hope, really, that the company could on that proceed to develop additional supply, increase the fire

protection, extend the mains, and that after all those expenditures were made the increase in consumption would carry them still to a reasonable return.

Q. Well now, you estimate, or your opinion is, that this company ought to be allowed to have a rate that would double its present gross receipts?

A. Yes, sir.

Q. You are familiar with the rates charged consumers by the company, are you not?

A. Yes, sir.

Q. I wish you would give your opinion as to how those rates should be affected by this proposed increase.

A. Well, that is a very large study by itself. I couldn't express that opinion off hand; I would make the greatest portion of the rate—I would make all that I could in the raise on the sliding scale against the city proper for the fire protection in the next few years. Then I would adjust the remainder of the money to be raised not equally among the rest of the consumers, but in such a way as to spare, if possible, the smallest consumer—the class of people that are needy—and perhaps to tax the more wealthy classes and the business classes and the manufacturing classes the difference.

Q. You would be an anarchist?

A. Oh, I am on rates; yes, quite an anarchist. That has
198 been generally done everywhere where I adjusted a rate. We have always eased it up on the needy and made up the difference on the well-to-do.

Q. Mr. Alvord, you understand that this company has a minimum charge to each of its consumers—that is, for domestic purposes?

A. Yes, sir.

Q. Would, in your opinion, this increase in rates involve a raising of that minimum charge?

A. Yes, I think it ought to. In most cases. There might be—there might be a meter minimum rate which was different from the flat minimum rate, but the whole proposition is best studied by classifying all of the present consumers——

Q. Assuming that the minimum meter rate is 75 cents a month, isn't it a fact that most of the consumers that you class as the poorer consumers are affected by that minimum rate—that is, pay that minimum rate instead of paying by the meter?

A. I think they are.

Q. And they would be cared for by changing the minimum rate?

A. Yes. You understand we have got just so much money to apportion. Our problem is how to apportion that justly, so that everybody can bear the burden equally. We can best do that by taking all the consumers, dividing them into classes, finding the approximate amount of water they use, and apportioning the cost of that water in such a way that we can raise the whole amount, and at the same time apportion the burden to the ability to bear it.

199 Q. What is your opinion as to the rates charged by this company to large consumers of water, manufacturing plants, such as that?

A. I don't recall just at this minute what they are; I don't remember that I know any particularly low rate.

Q. What is your rate to the Matz Hotel?

Mr. William McCarthy: Twelve and a half cents.

Judge Sanders: Per thousand gallons?

Mr. McCarthy: Yes, sir.

Judge Ritz: And what is your minimum on that?

Mr. McCarthy: $125 a month. They use more than the minmum. They go away beyond the minimum.

(Witness stands aside.)

200 WILLIAM MCCARTHY, a witness introduced on behalf of the applicant, having been first duly sworn, testified as follows:

Direct examination.

Judge Sanders:

Q. Mr. McCarthy, you live in Bluefield, I believe?

A. Yes, sir.

Q. How long have you been connected with the Bluefield Water Works and Improvement company, the applicant?

A. About thirteen years.

Q. What position have you held with this company during that time?

A. I have been superintendent.

Q. What are your duties as superintendent?

A. Well, it is a matter of supervising generally the property—works of the water company.

Q. A general supervision of the property and the operation of the company's plant?

A. Yes, sir.

Q. Mr. McCarthy, do you know Mr. Luce, who made the inventory of the properties of the Bluefield Water Works and Improvement company which has been introduced in evidence in this case?

A. Yes, sir.

Q. Have you seen his report?

A. Yes, sir.

Q. Have you examined it?

A. I have.

Q. I wish you would please state whether or not this report of Mr. Luce contains a correct inventory of the property of the Bluefield Water Works and Improvement company.

A. I believe that it does.

201 Q. You have made an examination of this report with the view of determining whether or not it correctly reported an-invoiced the company's property, have you?

A. I have.

Q. And you have found no errors in the report, have you?

A. No serious errors. I believe what few——

Q. I mean, no errors in the listing of the company's property?

A. No, sir.

Q. It has been agreed between the parties to this proceeding that this invoice made by Mr. Luce is a correct inventory of the property with certain exceptions. I believe you were present when that stipulation was entered into, and I will ask you to take up these exceptions which are contained in that agreement and state whether or not this property, as invoiced, and which was not agreed upon, but which was accepted by this stipulation, is correctly invoiced by Mr. Luce in his inventory (handing witness paper).

A. Well now, let's see. Page 49. I take it that must mean this 44½ yards of concrete, doesn't it?

Q. I suppose so. Let me see.

A. That is the only item of concrete which I see on page 49. Oh, yes. I see. In the spring-house. Well now, I don't know with regard to that particular item. I didn't calculate the cubical contents of that particular basin, but it is pretty good size. That basin must be 15 feet, I guess, in diameter, and I believe it is about 6 or
202 7 feet deep. The walls are pretty heavy, I believe 18 inches, perhaps, in the bottom; slightly less on the top, with heavy coping. Yes, that is it. What is the diameter? Does it show?

(Mr. Miller hands witness book.)

A. Yes, 18 feet in diameter; 7 feet deep. It doesn't show the thickness of the walls nor the thickness of the bottom, but it is well and substantially built, and I believe that the—I would believe at least that the contents are there unless—I would only convince myself that they are not there by actually going over it and checking up. You may have done that, Mr. Miller, and I have not. There is considerable concrete in this comb which we show here. There is also a concrete covering over this 18-inch vitrified tile pipe, which passes clear through, which is not really shown as a covering in this cut. There is also a concrete gutter, with a coping, entirely surrounding this basin, a concrete overflow outlet to this basin as well.

Q. Now you can take up the other items. Make such explanation as you can of all of them.

A. Page No. 50, square yards shingles on springhouse. That is the same springhouse, I imagine.

Judge Ritz: That mistake, Mr. Mack, Mr. Miller finds there were 307 square feet there; your report has only got 99 square feet.

203 The Witness: Which is that, now, the last item of shingles?

Judge Ritz: Yes. The last item. Mr. Miller thinks it ought to be thirty some square yards.

The Witness: Well, I was going to say, I seem to make it more than that, about 28 or 29, possibly.

Mr. Miller: Thirty-four. You might have made that mistake by dividing your square feet by 27 instead of by 9.

The Witness: That is about it, I guess.

Mr. Alvord: Probably a clerical error.

Judge Sanders:

Q. Then Mr. Miller's report in that respect is correct, is it?

A. Yes, sir, Mr. Miller is correct; it should stand 34 instead of 11. Now, on page 50, "length of 18-inch tile in springhouse." Well, that ought to be 27 additional to springhouse—21. Well, there may be a *l*sight difference there, and I presume there is possibly; but that is a very small item.

Judge Ritz: That is at page 127, that picture, Mr. Mack.

A. Yes, 127. Mr. Miller's correction there, I believe, was 21 feet. Well, I presume, if this had reference to the springhouse alone, I guess 21 feet might be nearly right. However, I presume that they may have added the two or three sections of pipe that lead from the overflow basin as well. I see that don't seem to be mentioned here, and they may have added that to it.

Mr. Miller: That is separately entered.

204 The Witness: Is it separately entered?

Mr. Miller: Basin to springhouse, 18 feet 16-inch pipe.

The Witness: Well, that would be from the basin or dam to springhouse. That would be about right. You see, there is a concrete dam on the upper side that holds the water back, and the water flows from the inside of the dam through this 18-inch terra cotta and comes up in the center in this cone opening. But I think that would be about right. I don't think it is necessary to note any correction there. I think that would check about right. If anything, I would say that there is even a little bit more than Mr. Alvord notes here, if there is any difference at all. Now, that was page 50.

Q. I note on page 61 Mr. Miller seems to have two corrections noted, one on the 264 cubic yards of concrete reported by Mr. Alvord, he finding the amount to be 192, and second, Mr. Alvord reports 76 cubic yards of concrete in the walls, 2 feet thick, while Mr. Miller, I suppose, reports 46.7. Now, I can only say in this connection that Mr. Luce is more thoroughly acquainted with the work done and the amounts of materials used and removed at this station, and unless I was to go over the matter carefully and check it I wouldn't be able to say but what his figures are correct.

On page 62, the item of 17,666 feet of poplar in joists, purlins, and framing was corrected after Mr. Miller had called their

205 attention to it, to 14,089 feet. That is simply an error, I think, in calculation.

Roofing lumber reported by Mr. Alvord under the same item, No. 11, is 14,700 feet board. That seems to have been found by Mr.

Miller to be 16,046 feet. I couldn't say which of the two would be right.

There is an item of 1,120 lineal feet of 2½ inch by 3 inch poplar moulding, reported by Mr. Miller, I believe, at 552 feet. I don't recall how much moulding we had. Unless I was to check it up, I wouldn't be able to say between the two which is correct.

On page 82, Mr. Alvord's report indicates, under item 22, 1,080 cubic yards of solid side hill rock excavation, while Mr. Miller reports finding 500. I will say in this connection that there is a great deal more rock removed at this point than the surface would now indicate. The rock at this point is inclined about 30 degrees with the vertical, or about 60 degrees with the horizontal. The pumping station itself is built parallel to and in line with the axis of this inclination. Now, in cutting out and excavating this quantity of rock, we found it necessary to take off much more rock than the actual requirements, you understand, to take care of the building; cutting off the toe of the slope left these ledges of rock piled up on each other without support, where the tendency was for them to slide down and perhaps cave in the side of our building. In
206 fact, several big chunks of this rock slid in while we were at work, and we took it all off. There is nothing there now in which any basis for an estimate of the original quantity of rock could be had—from which an estate might be made. We indicated to Mr. Luce very carefully the quantity of rock removed, with a description of its original shape and contour; and from this he calculated his quantities. In judging from the enormous amount of rock that we removed, I think that his figure is at least conservative, if not low.

Q. That is Mr. Luce's estimate?

A. Yes, sir, Mr. Luce's estimate.

Now, regarding the estimate of cast iron pipe made on page 92 of Mr. Alvord's inventory, I would say that last night I went over these figures and my figures checked very closely with Mr. Alvord's. I find that he was short about 40 tons, I believe, of pipe.

Q. Who was that that was short 40 tons?

A. Mr. Alvord. Mr. Alvord's report lacks about 40 tons of having as much as I figured that we have got. And as this represents about 1,200 feet of cast iron pipe, I take it perhaps that there are 1,200 feet of the Ada spring line between the Ada spring and the Ada pumping station that was perhaps left out of the account. The way the profile is drawn up this error could easily have crept in, and that is the only way I could account for it.

207 Q. Then, with the explanation that you have made, as I understand you to say, the report and inventory of the properties of the Bluefield Water Works and Improvement company, as made by Mr. Luce, and filed with the evidence of Mr. John W. Alvord, contains a correct inventory of the company's property?

A. Yes, sir.

Q. You are acquainted with these properties, I believe you say?

A. Yes, sir.

Q. And have acquired this knowledge of the property since you became its superintendent thirteen years ago?

A. Yes, sir.

Q. I believe you are also a civil engineer, aren't you, Mr. McCarthy?

A. Yes, sir.

Q. And have been such a civil engineer about how long?

A. About twenty years.

Q. Who assisted Mr. Luce in taking the inventory of the company's property?

A. Mr. Akers, the foreman, assisted him on the outside, and while that was going on I got such information as I could on the inside—that is, from the office.

Q. The information that you gave him from the office, and which he used, as far as was necessary, in making his report, was furnished him correctly, was it?

A. As far as I know and believe, it was.

Q. This invoice of the company's property appears to have been made as of the first day of January, 1915. I will ask you
208 to state whether or not that inventory made as of that date truly represents the properties of the water company at this time.

A. No, it does not.

Q. Has there been an increase or a decrease in the property?

A. There has been a very material increase.

Q. I wish you would please state the increase. I mean by that, what property has been acquired since the making of this invoice.

A. It would be rather difficult for me to state that, because I haven't got any particular list. Most of the additions have been made in the way of new mains, new water mains, and services. We have also acquired a small additional strip of land near the Ada spring for the protection of the Ada spring and for the protection of the reservoir below the spring—for the protection and maintenance of a reservoir below the spring.

Q. These acquisitions of property by the Bluefield Water Works and Improvement company since 1915, will you file with your evidence a list of, together with the valuations thereof?

A. Yes, I can do so.

Q. Then, excluding from consideration the costs of the property since the first of January, 1915, I will ask you to state if the company now owns all of the properties mentioned and invoiced by Mr. Luce as shown by his report filed with the evidence of John W.
209 Alvord.

A. Yes, sir, they own them.

Q. Is all this property referred to necessary for the operation of the company's plant and for use in connection with the furnishing of water to the city?

A. Yes, sir, I would say that it was.

Q. And was acquired for that purpose?

A. Yes, sir.

Q. What other business is the Bluefield Water Works and Im-

provement company engaged in now except the business of furnishing to the city of Bluefield water?

A. No other business.

Q. Was it ever engaged in any other business?

A. Yes, it was.

Q. When?

A. Well, in years past up to perhaps twelve years ago.

Q. Then since that time, say twelve years ago, it has only been engaged in the business of furnishing to the city water?

A. Water, that is true.

Q. What other business was it engaged in prior to that time?

A. It was engaged in the real estate business.

Q. Was the business of furnishing water to the city of Bluefield and the real estate business a combined business, together, or was it kept separate?

A. Well, I rather believe—I am not acquainted with the exact inner workings of that part of it, but I rather believe, from what I learn, that the two businesses were combined.

210 Q. However, they only continued the business of real estate for about one year after you came with the company?

A. Well, say two years.

Q. Well, two years after you came with the company?

A. Yes.

Q. And from that time on you have been engaged in the business of furnishing water to the city?

A. Yes, for about ten or twelve years—it may not be twelve years.

Q. Well, I don't care for it accurately from you. Where does the company get its supply of water that it furnishes to the city of Bluefield?

A. It get it from springs along the base of East River mountain.

Q. How many springs, Mr. McCarthy, has the company from which it furnishes the water supply to the city?

A. I believe about 22.

Q. Are they all in use.

A. No, they are not all in use.

Q. How many of these springs are in use?

A. I think perhaps 18.

Q. Why, then, the purchase of the ones not in use?

A. Well, we have the Jarrell spring, which is not in use. It was purchased some six or eight years ago, with the belief that it would be necessary in a short time, to develop—to add to our present water supply. We purchased a similar spring, a little spring close to the Ada spring, which was used for watering sod around the Ada spring in order to keep it green. There was some question raised by

211 the city several years ago about whether the water from that spring was really good water or not, and whether or not it was contaminated, and we abandoned its use for that purpose.

Q. Now, in the purchase——

A. Pardon me just a minute.

Q. Yes.

A. We also bought an additional spring about the same time near

our Ada pumping station, which the city put out of commission by turning sewage into a sink here east of the city, a little more than a year and a quarter ago. That spring is not in commission at this time; its usefulness having been destroyed.

Q. How is that spring designated in the report? Do you remember?

A. I don't recall. I can get the number of it in a moment.

Q. That is the Wirt Bailey spring, isn't it?

A. We call it the Estill Bailey. No. 22 is the number of it.

Q. In acquiring these 22 springs that you have referred to, did the company acquire any real estate in connection with them?

A. Yes. They acquired real estate in connection with each and every one of them.

Q. Was the real estate so acquired by the company necessary in the operation of its water plant and in furnishing the supply of water to the city, and if so please explain why.

212 A. Yes, it was necessary to buy a section of real estate surrounding each spring in order to protect the spring itself from surface contamination. We have, in some instances, enough land around each spring that we own, but in the great majority of cases the amount of land that we own is far too small to fully take care of the waters of each spring.

Q. Judge Ritz, in his examination of Mr. Alvord, has referred to various tracts of real estate purchased. I wish you would please explain, Mr. McCarthy, in detail, why it was necessary in each one of these purchases to acquire this real estate. You say for the purposes of preventing the pollution of the water. Just explain how and why that became necessary and how it protected the water from pollution.

A. By owning a section of real estate around and above the spring we are enabled to fence it and keep stock, in the first place, away from the immediate vicinity of the spring. The more real estate we own around a spring the further we can keep stock from it. We own some springs here that the amount of land was—we owned with the springs made it rather difficult to even put the proper surface ditches around the spring and keep within the limits of our own tract to guard the water. I might mention here, in connection with spring No. 6, particularly—In the first place, the water company bought, when they bought spring No. 6, a half an acre of ground. A

213 number of years later they bought about two acres additional from a point above this spring adjacent to it and above—and a few years—only a few years later still, they bought another couple of acres still further up on the mountain above it in order to prevent stock from getting into the little seeps and water that ran out of the ground in times when water was plentiful, and to also keep stock from coming in contact with that water. Now, we bought, I might say, also in connection with this Ada spring supply, a tract of land of 236 acres, I believe, known to us as the Henry Bailey tract; spring No. 15 is located on it. Judge Ritz, I believe, has in mind why we bought that. He made a speech up here at the courthouse one night at an indignation meeting in which he stated, if my memory serves

me aright, and I believe it does, that this water company should be required to purchase enough land around those springs to protect the supply.

Judge Ritz:

Q. That is correct, isn't it, as a sanitary proposition?

A. I think so.

I can say we also bought 60 acres—80 acres—at spring No. 16, which tract has two springs on it, for the same purpose. We bought that because the water at times in the spring comes out of the ground away high on the side of the mountain; and we ran tile away up within a few hundred yards of the top of the mountain in
214 order to catch that water and take it under ground so that it didn't come in contact with the surface, to the spring proper, or to the intake of the pipe line. I believe that covers the situation.

Judge Sanders:

Q. Well, did you deem it, and do you now deem it necessary that this real estate be purchased in order to properly furnish this supply of water to the city, considering sanitary conditions?

A. I certainly do, and I really feel that one of the things that this company ought to do would be to purchase a very much larger tract at nearly all of these springs in order to keep vegetable matter from growing on them, you know, to keep from cutting off the timber, and in that way prolonging the life of these springs.

Q. Then your opinion is that you have not acquired enough real estate in connection with these springs?

A. Nothing like it; nothing like it.

Q. To give the city a pure supply of water?

A. No, sir, nothing like it.

Q. Is this land that you refer to around the springs used for any other purpose by the company?

A. No, sir, it it not. We have it fenced, in the main. I believe nearly all of our land is fenced.

Q. Was it acquired for any other purpose?

A. No, sir, it was not.

Q. And has it been uses for any other purpose?

A. No, sir, it has not.

215 Commissioner Northcott:

Q. You don't even farm the Bailey tract?

A. No, sir; we don't even allow stock on it. We keep a man living on it as a caretaker, but we don't farm it.

Judge Sanders:

Q. Then the object of the purchase of this real estate is to furnish a better supply of water to the city?

A. Yes, and for the purpose of protecting water against probable pollution.

NOTE.—At this point, it being 5:15 o'clock p. m., an adjournment was taken until the following day, Wednesday, July 26, 1916, at 9.30 o'clock a. m., at which time this hearing was resumed as follows:

(Last question and answer read.)

A. In buying these tracts of land, as a rule, we followed the practice of only taking what was actually necessary to properly surround the spring in order to put in surface ditches. In two instances, however, we have got a rather larger tract, one of them a tract of 236 acres, another, I believe, of 41 acres. In each of these instances the tracts are somewhat larger than is necessary to actually protect the water supply, but we were not able to secure a smaller portion, as the owner of the property wanted to dispose of all or none of it.

Judge Sanders:

216 Q. Well, is it proper or practicable to dispose of any of this real estate which you necessarily had to acquire in purchasing the springs, or is it necessary that it be retained in order to prevent the water from being polluted, as you stated?

A. I believe it would be well to retain it, in both instances.

Q. Has that been the view of the company, and is that the reason why it has been retained?

A. That is the reason why it has been retained. We have had an opportunity—at least, inquiries with reference to a portion of one of these tracts, but we decided, owing to the difficulties that we had in securing this tract, to protect the purity of this water—we decided not to entertain them.

Q. What demands have been made on you by the city or citizens of the city to acquire land surrounding your springs to enable you to prevent the pollution of the springs from surface water and otherwise?

A. Well, there has been agitation here for years. A great deal of it, I think, was improper, by reason of the fact that the people generally didn't understand what they were complaining about. However, the complaints were vigorous; caused us a great deal of trouble. We have spent a great deal of money here in taking care of the watershed, particularly in the vicinity of these springs, and how much of that amount of money that we have spent has

217 gone toward securing a better water I am not fully posted on; I couldn't say; but I think it has all tended to make a better supply, but it is not along the lines as the people supposed. In other words, the people believed here at one time that this Ada supply of ours was a terribly contaminated water supply. I believe a great many of the people of Bluefield here really thought we were pumping water out of East River. I have been asked that question many hundreds of times, I believe. In fact, I have been told right to my face, and my statement to the contrary has been contradicted right to my face, that I knew we were pumping out of East River,

and I think very much of this understanding has grown up among people who didn't take the pains to investigate.

Q. Mr. McCarthy, you have read through the report upon the value of the waterworks properties of the Bluefield Water Works and Improvement company, dated Bluefield, West Virginia, January 15, 1915, which was filed with the evidence of Mr. John W. Alvord, have you?

A. I have.

Q. Are you familiar with the prices that he has put upon the properties of the water company, as invoiced by Mr. Luce, which inventory is filed?

A. I am.

Q. I will ask you to state if these values, in your opinion, are correct values, and if he has properly and correctly valued the property of the company.

A. They are correct values, in my opinion.

218 Q. Please state whether or not you are familiar with the values of real estate in the vicinity of and in the sections of the county and location of the springs owned by the water company and referred to by you, and of the lands owned by the water company purchased in connection with the springs, and the houses thereon?

A. I am familiar with the values of such lands.

Q. Please state whether or not these values placed upon this real estate by Mr. Alvord in his report of valuation is a reasonably fair value of this property.

A. I consider them a reasonable and fair valuation.

Q. Are you familiar with the prices that are paid for construction work, such work as the water company has constructed for the use and equipment of its water plant, furnishing a supply of water to the city?

A. I am.

Q. I will ask you to state if the valuation that Mr. Alvord has placed upon the company's property—that is, the pipe lines and buildings and concrete work and all other construction work mentioned by him in his report, are fair prices for this work and a fair valuation of the property and material that was used in this work.

A. I consider them very fair prices. It is true that to look at a small item of concrete work containing a few yards, listed at $24 or $25 a cubic yard, would look rather high in comparison with other heavy work, such as railroad abutments, tunnel linings,

219 and things of that kind, where work is done for eight—seven and eight dollars per cubic yard, material delivered by the car right on the ground; but in these cases of ours the materials for concrete of that nature has been carried to the ground; even the crushed stone is carried to the ground. We used limestone for concrete. That limestone is carried to the ground and hand-knapped—hand broken. It cost $2.25 a yard to knap stone by hand. The sand for this concrete was carried on the backs of men in most places, mixing boards were carried, lumber for forms were carried. In fact, every single item that goes into the construction

was carried, I think, on the backs of man, rather than in a wagon. This can be said of the tile pipe used in infiltration plants, was carried; the pipe for the trunk lines of these springs, or part of the way, was carried by men and delivered at the place of use.

Q. Why was it that this material for construction work was carried instead of hauled?

A. Why, on account of the rough character of the ground. It wasn't possible without a great deal of work in the way of clearing up and getting a place to drive a team to many of these springs.

Q. Well, preparing a place of that kind would have been, or would it not have been, more expensive than to have paid for the carrying of the material?

A. Well, it would have been too expensive. The amounts
220 were too small to go to the expense of clearing it and making a roadway. The amounts of these items are very small; the items themselves are small. The price per unit seems large, but the amount of material used was small, and it is only the unit cost that appears large. I would say, too, in reference to clearing the ground on which these springs are located—It will be understood to begin with, that these springs issue from the ground in the hollows—in the ravines—in other words, on the slope of East River Mountain. That is true in every instance. Now, in a few of those instances—many of the instances, in fact, I believe, of this first series particularly, there is a pasture field either on one side or both sides of these spring tracts; and in clearing off this land, the farmers, instead of burning the logs and chunks, they simply rolled them down the mountain into these ravines, and we found, in a number of instances, I believe I wouldn't exaggerate if I would say we found logs ten feet high. When we come to clear it up our method was to split them up and stack them end wise for a month or so until they dried, and then in order to protect the trees growing on these tracts we burned them in small consignments; we didn't burn the whole pile at one time; just simply kept feeding them on a pile, and as they burned down added more until we got rid of them.

I think maybe that would apply to all of the spring tracts
221 except one or two, maybe one tract that we didn't have any particularly large item of expense; but it is generally true of all of these springs in the gravity series.

Q. What can you say about the cost of these clearings in the gravity springs being a reasonable or unreasonable cost?

A. Well, it is placed at about $100 per acre. I remember when I was a boy we used to clear land in our part of the country for $20 an acre, when labor was 75 and 90 cents a day, and the men that did the work didn't make very much money; they made a living at it, I believe; but comparing that class of cleaning up land and this class, I would say they were entirely two different classes of conditions, not at all similar.

Q. Well, what was the difference?

A. Well, in one instance, where land is usually cleared up, they would use oxen or mules to pull these logs together; they had

plenty of hardwood to mix with these logs to burn up. In our case we didn't have that; we didn't have any hardwood to mix with these rotten logs or sogs. We simply had to split them up in order to dry them out to burn them. That was one reason. Another reason is that, particularly on the east side of these gravity springs, the conditions under which men work are not good; a long ways for men to go to work in the morning, perhaps, a long way for them to return at night. It is rather difficult to get good men at
222 the ordinary day wage to work at that sort of work. The same may be said in regard to the digging of infiltration lines. Those lines were dug through tough clay and rock, large boulders of rock were generally found in most of them, and in getting out those boulders, shooting them up to get rid of them, the sides of the ditches were knocked in and very much more amount of material was handled than there would be if the lines were dug through nothing but clay, or if they were dug through solid rock. We encountered, it is true, in a few instances—in fact, many instances, we encountered solid rock in places, but, as a general proposition, the ditches were dug through heavy red clay through water all the way. If there was no water there it wouldn't be necessary to dig these ditches; but we dug the ditches in order to take the water that came to the surface in many places in little springs. That water we led through infiltration lines so as not to allow it to come to the surface and avoid the contamination that might follow if it was allowed to come to the surface.

Q. Was it necessary for the development of these springs to do the clearing referred to?

A. Oh, yes, to relieve these logs and old trees that had fallen there years and years before, lying around; it wouldn't help the appearance of things, neither would it help the condition of the water. We cleared off everything, even small brush, at the time, and burned it up, leaving all of the trees, no matter how
223 small. We dressed them up and trimmed them out and allowed them to stand. They are still standing, of course.

Now, I might say, too, in addition to all of these prices and expenses shown by Mr. Alvord on this inventory, that the cost of doing this work was summed up and given to Mr. Luce. He had a record of the exact amount of dollars and cents spent in both materials and supplies used separately to check against his valuation, which would aid him very materially in ascertaining the values shown.

Q. The cost of what work do you mean, Mr. McCarthy?

A. I mean now the cost of all of these improvements made on both series of gravity springs, the Ada spring, the Ada dam, and the Ada pumping station—in fact, all of the improvements that has been made to the plant here in the last twelve or thirteen years.

Q. And such as are referred to in his inventory of the company's property?

A. And such as has been referred to in the inventory made by him of the company's property.

Q. Who furnished him this information?

A. Well, I furnished him a portion of it. It was furnished principally and as a whole by our bookkeeper in Philadelphia.

224 Q. What have you to say, Mr. McCarthy, as to the value of the springs as water rights that the company owns referred to in the inventory and in the report of values made by Mr. Alvord?

A. Well, taking Mr. Alvord's explanation of the values, I think and believe they are all right. Of course, that opens up a new thing to me. I wouldn't have known myself how to go about ascertaining the value of springs. I knew they had a value. The amount placed on them by him, however, was a little smaller than I really believed they were worth. I had in mind that perhaps they were worth a little more.

Q. Than the value placed on them by Mr. Alvord?

A. By Mr. Alvord. Mr. Alvord's reasoning is very clear, and I will accept it as a fair valuation.

Q. Is that your opinion, that these springs are of the value placed on them by Mr. Alvord?

A. I consider them so.

Q. In this connection, I wish you would please explain the location of the springs owned by the company and whether or not the flow from these springs is adequate for water supply for the city, and what difficulties the company now labors under, and has labored under for years past, in furnishing to the city an adequate water supply.

A. The springs of the Bluefield Water Works and Improvement company are very nicely set out and located in a map that accompanies Mr. Alvord's inventory, attached to and made a part of it.

225 Q. Mr. Luce's inventory, you mean?

A. Mr. Luce's inventory, attached and made a part of it. The No. 1 spring of the gravity series, as well as the Beaver Pond spring, lays and is located and situated about two miles from the city hall in the city of Bluefield, in a southerly direction from the city hall. Now, the gravity springs continue at intervals along the side of East River Mountain for several miles east—three or four miles, perhaps. Than we have another series of springs in the vicinity of the Ada spring, still along the base of East River Mountain, extending eastwardly about nine miles, perhaps, from the city hall. These springs afford considerable water at certain seasons of the year. It would be rather hard and rather difficult to estimate the maximum flow. In fact, we never considered the maximum flow to amount to anything. The maximum flow would mean the amount delivered by them in very wet weather, or immediately after heavy rains. This flow does not keep up but a very short time after these rains, and in a week or such a matter after the rain the water is usually down to normal again; usually in two or three days after a heavy rain the water is down to normal; so that the maximum flow of the springs has never been counted on by us. The minimum flow, ho-ever, we have approximated and estimated several times—a number of times—and we are better acquainted with that flow, as

that is the flow that materially affects us. The minimum
226 flow from the western series—the first series of gravity springs—is found by us somewhere in the neighborhood of 150,000 gallons a day. We measured them one year—I don't recall what year——

Q. Now, what spring is that?

A. We are speaking now of the gravity springs, the first series.

Q. All of the gravity springs furnish you, at the minimum rate, 150,000 gallons a day?

A. Well, 150 and above. I was going to say that on October 7, 1908, during a very dry period, we measured the flow of those springs and found them to equal 177,627 gallons; the flow from the Ada spring on the same date was 636,987 gallons, measured by the engine counter on the Ada pump, which was pumping all of the water that issued from the Ada spring on that day. The flow from Beaver Pond spring I haven't got at the same time, for the reason that the pump wasn't running, but I would say that its flow would be somewhere in the neighborhood of 250,000, perhaps, or 300,000 on the same day. That constitutes and makes up the flow from our springs. Since that time, however, we put into commission a spring known to us as the Estill Bailey spring, near the Ada pumping station, the normal flow of which was about 240,000 gallons daily. That spring didn't vary much with the season. It was about the same winter
and summer. That was the spring that I referred to yester-
227 day as being put out of commission by sewage emptied into a sink hold by the city; and since April 1st of last year, or about April 1st of last year, it has not been used by us; the water hasn't been fit to use since that time.

Now, I might say in this connection that during the dry weather periods of the past two years we have been considerably embarrassed by the failure of our water supply on account of dry weather. A number of times last year between July and December, and over the corresponding period of the year before, we were pumping into this city—that is, pumping and furnishing every available drop of water that we had; and a number of times during that particular period the amount of water furnished was not equal to the consumption; that is, it wasn't uniformly equal to the consumption. The water impounded in our storage tank here would drop from day to day, you understand, until a thunder storm or rain storm would set in and raise the waters momentarily and allow us to refill—get our supply back again; and in a few days we would notice the quantity sinking again. That would continue for some time during the dry weather. So far this year we have noticed no shortage of water, and I don't presume we will have any for at least a month yet, on account of the very heavy and severe rains that we have had in the last month.

228 Judge Sanders: Just read the question, Mr. Price.

(The following question was read:

"In this connection, I wish you would please explain the location of the springs owned by the company and whether or not the flow

from these springs is adequate for water supply for the city, and what difficulties the company now labors under and has labored under for years past in furnishing to the city an adequate water supply.")

A. To answer that question fully, and to go into the troubles that this company has labored under, would take me back before my connection as superintendent with the company. I know, however, that prior to my connection with the company that very serious shortages in water has occurred here. Since my connection with the company we have materially increased the amount of water. We have bought additional springs and greatly improved the springs that were formerly owned by the company, at a very great expense. This has carried us, as I have stated in this question, down to two years ago, with an apparently adequate supply of water for the actual needs of the city; but as I have just stated, for the past two years we have been right up against the limit.

Q. When the flow of the water is great the needs of the supply of water is lessened. Isn't that true?

A. It is a fact that during the wet seasons our supply of
229 water is the greatest and the demands made on us for water are the least.

Q. Then when the supply is small, or when it is the smallest, the demands are the greatest?

A. When the supply is small the demands on us for water are the greatest.

Q. And as the supply is reduced the demands are increased?

A. And as the supply is reduced the demands are increased; that is correct.

Q. Because as a fact your supply depends very largely upon weather conditions, whether the season is a dry or wet season?

A. Very much so.

Q. Something has been said in the course of the examination of the witnesses in regard to the impounding of the water from the Ada spring. I will ask you to speak on that subject, as to whether it is practicable or not, and state what you have to say in regard to the regularity of the flow from the Ada spring.

A. It is practicable to impound a small quantity of water from the Ada spring. In fact, the company a number of years ago, built an impounding reservoir holding approximately 20,000,000 gallons immediately below the Ada spring. Water in this reservoir had been impounded for several years following the building of it, and continued so until about 1908, when, at the direction of the city officials,
the water in that impounding reservoir was allowed to run
230 out—we opened the sluice valves and allowed it to run out.

The supposition was on the part of the officials—and I will say "supposition" because I am satisfied that there was no good reason why that action should have been taken by them—the water was claimed to have been had. No investigation, to my knowledge, was made by them to ascertain the quality of the water, or the quality of the water that might be impounded in this reservoir. Of course, it is true the amount was small, only 20,000,000 gallons, but at the

same time I think that it is very important, and I think even today that that water should be kept impounded in that reservoir. However, the order has never been lifted, and no change has ever been made in the conditions there. We are in the position to, with very little work—to maintain at that point—at least to impound during the flood seasons of high water at Ada spring, when we are not pumping the water from Ada spring or only a small portion of it, the full quantity of 20,000,000 that might be held there until the dry weather season, you understand, and assist very materially in the handling of a serious fire here in town, more particularly for fire purposes than for domestic purposes, as the quantity impounded wouldn't be large enough to seriously affect the amount of water that we might pump in here daily on account of a water shortage otherwise. I might add to that that my understanding is that that storage dam or
231 reservoir was built for the purpose of maintaining water there to be used in the case of a serious conflagration here when the Ada spring would not be supplying more than the amount of water ordinarily used in domestic consumption.

Q. Did you speak as to the regularity of the flow from the Ada spring?

A. I don't believe I made reference to that. The flow from the Ada spring is very regular. During very wet weather I have seen the waters pour out of Ada spring when I believe they exceeded perhaps five or six million gallons a day, for perhaps a day or two, when they would drop down to maybe a million to two million gallons, and during the summer months the supply is fairly regular, about in the neighborhood of half a million gallons.

Q. How does the regularity of the flow from the Ada spring compare with the regularity of the flow from the other springs that you have referred to?

A. Well, I don't know that I ever made a comparison exactly; but I would imagine that there is a similar ratio between them all. That takes into account even the gravity springs, excepting, you understand, the Estill Bailey spring that was damaged by sewage. That spring I have never been able to ascertain was materially influenced by either wet or dry weather, having the same flow ordinarily the year around; but all of the other springs, I think, are seri-
232 ously affected by dry weather, and I believe the ratio between them is very similar.

Q. As I understand you, shortly after acquiring the Ada spring you put in an impounding plant, and you began to impound water there until the city of Bluefield protested against the use of it, or protested against this water being impounded. Is that correct?

A. That is correct.

Q. And since that time, have you abandoned this impounding plant?

A. No, sir; the reservoir is still intact, and with slight repairs, and with the use of a team or teams to rescrape the interior—the bottom, in other words—of the reservoir, to get rid of the vegetable growth that has since grew up in it, this reservoir is in good shape to take care of water today. The spillway, perhaps, would have to be re-

lined. The dam was built originally of logs and boards, sheet piling; but since the building of the dam the cribbing has been filled with rock and dirt—earth—as well as the inner face has been added to with dirt, and puddled, so that that part of the dam is still intact. The logs now don't materially affect the dams one way or the other. It is not necessary to rely on the support the logs originally gave the dam to impound water. There is rock and dirt enough in the dam to maintain this supply without the logs, so that as a utility
233 the dam is an everlasting one.

Q. You are not, however, furnishing any water to the city from this impound?

A. No, we are not impounding any.

Q. And have not been since the city protested against it?

A. Yes, that is true.

Q. Would it materially aid you in furnishing the water supply to the city to use this impound?

A. It would materially aid us in supply- the city in the event of fire. Of course, it would add some to our supply in the event we ran short in dry weather. Twenty million gallons distributed throughout the course of two months in very dry weather might very materially add to our supply of water; but particularly during a big fire here, that dam, as I stated before, should be kept full of water.

Q. Then if permission be given you by the commission to impound water there and use the water from the impound it would greatly aid you in your water supply to the city?

A. It would.

Q. You have spoken of your water supply, and that that supply is inadequate. I will ask you to please state how or in what way you can add to that supply, if you know.

A. Well, the most feasible route, I believe, if the supply could be obtained legally, would be from the Bluestone river. I am inclined to that opinion. We have several sources from which water
234 might be obtained. It could perhaps be obtained from Wolf Creek, in Bland county, Virginia, across East river mountain, but the putting in of a plant would cost much more than it would in this instance. We might also get water from New River, twenty miles away; but in both of these cases I believe it would be necessary to install double pumping stations—that is, relay pumping stations—or, in the first instance, to tunnel East River Mountain. The cost in both instances would be about the same. The Bluestone supply, if an impounding space large enough to hold back the amount of water that we needed might be found, would be the most feasible, in my opinion, and practicable.

Q. Well, where would you have to go on Bluestone to do this impounding, Mr. McCarthy?

A. My opinion is that we would have to go to a point about six miles above Graham. At a point about four miles—three miles, perhaps, above Graham, the best location could be found; the valley is wider, and a place perhaps large enough to impound could be found so as to get the required amount of water we want dammed; but it is in limestone formation, and the limestone in this section is

cavernous; the courses are vertical, or nearly vertical, and are broken up, so that the matter of impounding a large amount of water in a section of that kind would be a serious one on account of the water finding its way into the caverns, you know, and losing it. Now, to go to a point two miles, or three, further up, the valley nar-
235 rows up considerably; and the finding of a space large enough for the impounding of 100,000,000 gallons would be rather difficult. In my opinion perhaps two or three dams might be necessary instead of one. I might say, too, that the grade of the valley upward toward the head of Bluestone increases naturally as you go towards the head, consequently the water impounded would be small in proportion to the area of the dam itself.

Q. Do you know what difficulties you would meet with in acquiring water from Bluestone or Wolf creek?

A. Well, I am not thoroughly acquainted with just what difficulties might be encountered. We would perhaps encounter legal propositions that would make it difficult. We are not permitted to do business in Virginia. We would have to get a Virginia charter; and what right we would have to condemn in Virginia to furnish a city outside of the state I am not advised, but I imagine that all of our negotiations would have to be carried on in a manner thoroughly agreeable to the people.

Q. By voluntary contract?

A. By voluntary contract.

Q. What have you to say about the water right of the Bluestone river already having been acquired by someone else?

A. The water rights of Bluestone river, as I am, I believe, reliably informed, belong to the Norfolk and Western Railway company.

236 Q. From what points?

A. Well, from a point up on Bluestone, I don't know how far, but that is not material, as there is no large streams enter Bluestone on the Bluestone river until you get to Graham, and then it is only a small stream found to enter into it, to a point considerably down on Bluestone river, down towards Bramwell, or perhaps below Bramwell.

Q. Are there any other sources that you can look to except the ones named by you?

A. Well, we have Brush Fork, a sluggish, muddy stream in this county, perhaps four or five miles away. We have another known as the Mud Fork, I believe, at Bluestone— —

Q. Where is that?

A. That is between here and Pocahontas along the Norfolk and Western Railroad.

Q. About how far away?

A. I presume it is eight miles. And the waters of that stream are entirely taken care of by the Norfolk and Western at its mouth.

Q. That is mud fork?

A. Yes, by a large storage dam.

Q. You say that the Norfolk and Western has acquired the water rights on that stream?

A. They have.

Q. Entirely?

A. Yes, sir. I might say, too, that I was employed by the Norfolk and Western as roadmaster on this division for several years, and that during my service with that company it was my duty to look after, locally, the water used by the railway company
237 for their engines on this division; and at least two seasons that I was with the railroad company they had a very serious shortage of water on Bluestone; there was not enough water at Graham nor at Falls Mills—Not at Falls Mills, but at Flat Top Yard, where the railroad company have water tanks, to supply the railroad company with water at those two points. They pump the water from Bluestone for those two tanks; and I recall distinctly at one of these seasons at least there wasn't any perceptible amount of water going over the dam at Falls Mills; a little trickle that could be carried away easily in a bucket if it was caught by one person. I remember, too, that in order to get water for the Flat Top Yard tank, that we dug a pit down in the sand and gravel in the bed of Bluestone river, right near the bridge and close to the pumping station, and put the suction end of the pump down in this pit; and by pumping that pit we got considerable water; not enough, however, to supply the tank; and water for the railroad company was hauled in tanks from a supply the railway company had down here near Ingleside—I don't recall the name of the tank they have there—but nearly all of the engines used here on the Norfolk and Western on the Pocahontas division at that time were supplied with three tanks, that is, one tank connected with the engine in the usual way, with two additional tanks put into a gondola car immediately behind this
238 tank; and these engines were run with these tanks east of here to Ingleside and filled with water and used to operate this Elkhorn coal field.

Q. What can you say about whether or not it would be practicable to use the water from Brush Fork?

A. I would say that it would not be practicable. In the first place, it would require large storage dams there, and the water, to begin with, is very poor looking water. Of course, it is true it might be filtered. At the same time, judging from my knowledge of Brush Fork and its appearance it is entirely too small to go to the expense of installing a plant of the size necessary to take care of the needs or possible needs of Bluefield for the next fifteen or twenty years.

Q. I believe you say that your water supply is inadequate to meet the existing demands of the city. In what way and to what extent is it inadequate?

A. It is inadequate to meet the demands of the city of Bluefield, in dry weather, particularly; it is inadequate to meet the demands of the city of Bluefield in cases of fire. We have here, as far as our distribution mains are concerned, a very good distribution system, as far as it goes, but at this particular time, if the city continues its demands on us, and we have reason to believe they will, about 35,000 feet of additional six-inch pipe will have to be laid, and

about 3,700 feet of 10-inch pipe, to give the city a good, reasonable fire service.

239 Q. What will be the cost of the equipment necessary to give to the city a proper supply of water to meet existing conditions and demands?

A. To put in these mains I estimate will cost about $40,000; and to get an additional supply of water adequate for the present needs and to take care of the reasonable requirements in the future, from the information at hand, I take it that about $240,000 would be necessary—$240,000 additional would be necessary.

Q. Then, as I understand you, it would cost forty thousand, did you say, or fifty?

A. Forty thousand.

Q. Forty thousand dollars to furnish to the city water to meet existing demands and conditions?

A. Yes, sir.

Q. And to provide for the near future that it would cost something like $240,000?

A. Yes, sir, in addition.

Q. In addition to the $40,000 necessary to be spent now?

A. That is very true.

Q. And in addition to the outlay that has already been made by the company?

A. In addition to the outlay already made by the company.

Q. And now in operation?

A. And now in operation; yes, sir.

Q. I see filed with the record in the case of the City of Bluefield against the Bluefield Water Works and Improvement company, which case is consolidated with this case, a copy of the

240 printed rules of the company. I will ask you to state if those are the rules of the company, and if they are refer to them and make them a part of your evidence.

A. They are the rules of this company, and we operate under them. I refer to them and make them a part of my evidence.

NOTE.—At this point, it is agreed between the parties hereto that the evidence taken in this case and that the evidence taken in the case of the city of Bluefield against the Bluefield Water Works and Improvement company, consolidated and heard with this case, shall be taken, considered, and read in both cases.

Q. These printed rules of the company to which you refer, I believe were adopted in 1908. That is right, isn't it?

A. That is correct.

Q. Since that time, has the company operated under these printed rules?

A. They have, with the exception of a modification of a few of them, made necessary by the adoption of rules by the Public Service Commission which we are required to operate under.

Q. And with that exception the printed rules are the rules of the company?

A. Yes.

Q. And since the modification was made as you have stated, they have operated under the printed rules with the modifications so made?

A. Yes. And with the exception that in addition we are now rendering bills for service quarterly instead of monthly as
241 required by those rules. This modification was permitted by an order of the Public Service Commission at our request for such an order.

Q. Please state if you now recall what changes have been made in the printed rules.

A. Well, there is no material changes actually made in the rules. We simply modify our operation, you understand, to agree with the rules of the Public Service Commission.

Q. Then, as I understand it, you operate under the printed rules of the company except wherein they are in conflict with some order or requirement of the Public Service Commission?

A. That is correct.

Q. Do you know exactly wherein the printed rules do conflict with the rules or requirements of the Public Service Commission?

A. I only recall one, and that is with reference to the installation and maintenance of service pipes. Of course, that means a number of rules in that book, as there are a number of individual rules bearing on that subject.

Q. Are the water rates charged by the applicant water company fixed by the printed rules introduced in evidence?

A. They are, and they are found on pages 47 to 51, inclusive.

Q. Of the printed rules?

A. Of the printed rules.

Q. And how long have these rates been in force, and have they been conformed to in the conducting of the company's busi-
242 ness?

A. These rates have been in force, I believe, ever since the company began business, so far as I know.

Q. Well, have these rates been adhered to, conformed to, in the conducting of the company's business?

A. They have, strictly.

Q. I mean to say, in any instance do they charge a greater or less rate than those fixed by the rules of the company?

A. They do not.

Q. There has been something said in regard to this concrete work that was done around the springs on East River Mountain in regard to whether or not the stone would have to be carried to these places, or whether it could be acquired on the ground. I will ask you what you have to say about that.

A. The stone was carried to the place where the concrete was mixed and used.

Q. There is no limestone there, is there?

A. No limestone; no.

Q. Only sandstone?

A. Only sandstone.

Q. You can't use that in concrete work?

A. Not very well.

Q. Up till 1908, I believe the water company installed and maintained what is known as the service pipe, the pipe leading from the main to the property line of the consumer. Is that right?

A. That is true.

Q. Since that time who has installed and maintained the
243 service pipe?

A. Since the first day of April, 1908, and up to the first day of August, 1915, the property owners furnished the service pipe, the water company furnishing the corporation stop——

Q. Now, what is that? Explain it, please.

A. The corporation stop is the valve connection that is introduced into the main in which the service pipe is attached and leads the water into the curb. This corporation stop was furnished by the water company always; and the drilling and the placing of it was done by the water company, without charge to the consumer or property owner.

Q. Did you say since the first of April, 1908?

A. The first of April, 1908, the date on which our rules became effective.

Q. The consumer, then, as I understand you to say, since the first of April, 1908, has been installing and maintaining the service pipe with the exception of the corporation cock, you call it?

A. Corporation cock; yes.

Q. Well, how long did that continue to be done by the consumer?

A. It was continued from April 1st, 1908, to August 1st, 1915. That would be seven years and four months, I believe.

Q. How many services were put in during that seven years and a few months?

A. I don't recall. Mr. Alvord's inventory I guess I could get it off of.

244 Q. Do you want the report of valuation, or the invoice?

A. Yes, sir. About 1,600—What is the question again, please, sir.

(Second preceding question read.)

A. I haven't got the information exactly, but as I remember it, about 1,600 ordinary services were in use at the time that these rules were put into effect, and on June 30, 1915, we had 2,455. Of course, you will understand that that don't take into account the month of July. There might be a few put in during the month of July, but that would mean roughly about 1,500 services placed by the consumers or property owner.

Q. Well now, how many services have y now?

A. June 20, 1916, we had 2,600.

Q. June 30, 1915, you say?

A. 1616. At the present time, we will say.

Q. What is your understanding of who is the owner of the services that were installed by the property owner or by the consumer?

A. My understanding is that the services installed by the consumer is the property of the water company.

Q. How do you explain that?

A. Well, I understand that that has been the decisions of the several courts, beginning, I believe, in the Knoxville case. I don't recall now just how many decisions I have seen on that point; I believe several, however. I might say, too, that it has been
245 the practice and custom to consider, by the railway companies, sidings that have been put in by various parties and paid for, each individual piece going into the construction of that siding paid for by the party wanting the siding to the railroad company, and the railroad company claim the siding as their own property. That has been true of railroad companies, to my own knowledge, for fifteen or sixteen or seventeen years at least; and I would consider that a service pipe is very much the same class of property, as far as that point is concerned, as a siding is for a railroad company used by an individual in loading lumber or other materials.

Q. Reference has been made to the flow of water from Beaver Pond spring. Does your company use that entire flow? If not, why not?

A. We do during dry weather.

Q. Use the entire flow?

A. Well, we don't use the entire flow, of course; we are not permitted to use the entire flow.

Q. That is what I am asking you about.

A. Yes. We have to allow some of it to go to the farms below.

Q. You are only permitted to use the surplus? Is that it?

A. Yes, use the surplus.

Q. Mr. McCarthy, what have you to say about the rate charged for fire protection as compared to the rate charged to the individual consumers, or, in other words, the public service rate as com-
246 pared to the private consumers' rate?

A. Well, the public service rate here paid us is very small.

Q. Well, what is it? Please state that?

A. The amount paid by the city of Bluefield to us in the way of fire hydrant rentals amounts to about thirty—between thirty-one and thirty-two hundred dollars, I believe; I can't say just what it is; I am not posted just to the minute, but it is somewhere in that neighborhood.

Commissioner Northcott:

Q. How much per hydrant?

A. It is at the rate of $30 per year for each hydrant installed, with the exception of 15 hydrants that were installed as a franchise requirement, the services of 15 hydrants being furnished free to the city.

Judge Sanders:

Q. And how many hydrants?

A. About 124, I believe, now—126.

Q. What are the losses, Mr. McCarthy, in the collection of your water rents, if any?

A. Our losses are very small. I can't state just what they are. We have in the way of adjustments perhaps anywhere from two to four hundred dollars a year. Most of that is on account of rendering bills to consumers in error; that is, properly on account of not being advised as to vacant property by the property owners. The bills are made up and sent out, and the vancancy not being known to us until it is made known by the property owner, or the party that usually pays the rent. In such cases we always adjust this,
247 and get a voucher entry, you understand, to straighten up our accounts with. Our actual losses in water rent collections will amount maybe to less than $10 per year.

Q. Under your system of collection of water rents, your actual losses only amount to about $10 a year?

A. About $10 a year, I believe. Less than ten—that is, less than ten. I remember one year several years ago Mr. Rhodes informed me, I believe, that losses was less than $3 for one year.

Q. Then the prosecution of your collections is pressed diligently?

A. It is pressed diligently.

Q. What is the population of the city of Bluefield?

A. I estimate the population of the city of Bluefield about 15,000—between fifteen and sixteen thousand.

Q. What is its age?

A. Oh, I suppose the city of Bluefield goes back to about 1888. That is really about five years before my time. That is rather an assumption by me.

Q. The growth, then, of the city since 1888 has been a gradual, steady growth, then, has it?

A. Well, I couldn't say that it has been exactly gradual. I know Bluefield rather more or less intimately since 1897; and I would say that from at least the beginning of the year 1897 to 1902 the growth of the city of Bluefield was very slow—was very slow; but since that time, since 1902, the growth has been very rapid.

248 Judge Sanders: Well, I believe that is all I want to ask you, unless you have something to state.

Judge Ritz:

Q. Up to 1913, it fell off again?

A. Well, I don't know.

Cross-examination.

Judge Ritz:

Q. Mr. McCarthy, what is the capital stock of the Bluefield Water Works and Improvement company?

A. Well, I am not very well informed about the stock part of the company, but I believe it is $312,000.

Q. The capital stock?

A. Yes.

Q. Has it any bonds outstanding?

A. I understand that it has not.
Q. All stock. Do you know what was paid for that capital stock?
A. No, sir, I do not.
Q. Who makes the returns of the company for the purposes of taxation to the Board of Public Works?
A. The returns are made in our Philadelphia office.
Q. You don't know who makes them?
A. By Mr. Kurtz, I believe.
Q. Do you know at what valuation the company's property was returned for taxation last year?
A. Yes, sir.
Q. What was it?
A. I am not positive about last year, but I believe they returned at $190,000.
Q. $190,000?
A. Yes.
Q. About one-third of their real value, as you——
249 A. About one-third of the invoice value.
Q. Well, about one-third of their actual value?
A. Yes.
Q. And you have been paying taxes on it at that valuation?
A. Yes.
Q. Mr. McCarthy, a great deal of the works that is included in this inventory has been done since you have been superintendent of the water company, hasn't it?
A. A large portion of it has, yes.
Q. And you have the record of the cost of doing that work, haven't you?
A. Yes, we have.
Q. The work of constructing the Ada pumping station was performed since you were connected with the company, wasn't it?
A. It was.
Q. And laying the main from Ada pumping station to Bluefield?
A. No.
Q. That was done before you——
A. That was done prior to my——
Q. Have you a record of the cost of construction of the Ada pumping station?
A. Yes, in a way.
Q. What did it cost to construct that station?
A. Well, I don't know. I will see. (Refers to book.) The cost of the construction of the Ada pumping station, as furnished by Mr. Triol, our bookkeeper, is shown to be $55,414.30.
Q. What is included in that $55,000?
250 A. Everything that entered into the construction of that station, from the foundations to the top of the roof.
Q. Do you mean to say that it cost $55,000 to build that house?
A. Yes, sir, according to our reports.

Judge Sanders:

Q. You don't mean to say just to build the house, do you?
A. No, I mean the station. His question was on the cost of the Ada pumping station.

Judge Ritz:

Q. I notice item No. 11, Mr. Alvord's report of valuation, Ada station, he puts it at $15,000. Does that correspond with the item that you say actually cost $55,000?
A. I presume that has reference to the pump alone. I presume that is the pump, possibly. It may be the building alone.
Q. I want to find out what that $55,000 includes.
A. Item what, Judge?
Q. Eleven.
A. Yes, I would say that was the building, item 11.
Q. Page 72, it begins.
A. Yes.
Q. Well, have you got any figures on the cost of the construction of the building?
A. No, I have not. I have got them, too, but I mean I haven't got them available at this moment.
Q. Have you those figures at your office?
A. Yes, sir, I presume we have.
Q. Well, I wish you would get those figures, Mr. McCarthy, of the construction of the building?
251 A. Well now, that would be a very big proposition. I don't know whether I could do that very readily or not.
Q. You didn't keep those separately?
A. Well, yes, every item was kept separately, but you are to understand that our reports are simply made up by months, you understand, and forwarded to our Philadelphia office, where our books are kept. We keep no books here, and our reports are complete in themselves only by each month, you understand. We can get that information for you, I believe, off of the books of the Philadelphia office, without going to any trouble compiling it.
Q. You have those all here?
A. I think so.
Q. Now, you say the total cost of this station was $55,000, and the first item in Mr. Alvord's inventory that enters into that is the building, at $15,000. I am only giving the round numbers.
A. Yes, $14,000—well, $15,000 without depreciation.
Q. Yes, first cost.
A. Yes, sir.
Q. Then the next item, No. 12, does that enter into it?
A. Yes, that enteres into it.
Q. That is $2,931?
A. Well, yes.
Q. No. 13, coal chute. Is that a part of it?
A. That is a part of it.

Q. $867. Oil house, No. 14, that is also a part of it, isn't it?
A. That is a part of it.
Q. $168. The Worthington pump, is that also a part
252 of it?
A. That is also a part of it, yes.
Q. That is, I believe, $1,438?
A. Yes.
Q. The Snow pump, that also belongs to it, does it?
A. Yes, sir.
Q. And that is $18,644?
A. It seems to be $16,644.
Q. Sixteen. That is a six instead of an eight. Is that 16,844 or 16,644?
A. 16,644.
Q. Auxiliaries. Is that also included in your $55,000?
A. Yes, sir, that is a part of it.
Q. $1,049. Boiler plant—is that included in your $55,000?
A. Yes, sir.
Q. That is $6,444.
A. Yes, sir.
Q. The piping in the station. Did you include that in your estimate too?
A. Yes, sir.
Q. And that, I believe, is $1,639. The next item, piping in station yard, is that included in your item of $55,000?
A. What item is that, Judge?
Q. It is No. 20.
A. No. 20.
Q. It is on page 95.
A. Yes, I would say that was included.
Q. That amounts to——
A. $210.13, and another item of pump discharges, $939.40.
Q. Makes a total of $1,447.95.
A. Yes.
Q. Now, the next item, No. 21, concrete retaining wall. Is that included in it?
253 A. Yes, that is also included. I suppose it is included; now, I don't know. It is a part of the plant, I mean; it is a part of the——
Q. What I am getting at, Mr. McCarthy, is, all the items make up this $55,000, this total cost that you gave.
A. Yes.
Q. Now, No. 22, station yard improvements—is that included in your item of $55,000?
A. Yes, sir.
Q. That is $3,915?
A. Yes.
Q. No. 23, how about that, station miscellaneous?
A. Yes, that is included as well.
Q. That is $1,400. Now, are there any other items in Mr.

Alvord's inventory that go to make up that $55,000, the cost of the Ada pumping station?

A. Well, yes, item 23 here—item 23——

Q. I think we included 23, station miscellaneous.

A. Well, that may be.

Q. Yes, we included that. That is the one we quit on.

A. Yes.

Q. Are there any others in this inventory that go into that $55,000?

A. Well, really, I couldn't tell you, I am sure, without going over the inventory; I don't know whether it is all right here in one row or not—I mean, in one regular order. I haven't gone through it to know whether that covers every item or not.

Q. You can't say with certainty whether or not that item
254 of $55,000, actual cost, covers any more than the items I have enumerated?

A. No, I can't.

Q. Well, taking up these items that go into that—or some of them—have you any information, Mr. McCarthy, from which you could tell me what the company actually paid for any of the items of machinery that is in this station?

A. Why, we have copies of the invoice, and those copies were at the disposal of Mr. Miller. He checked them over, I believe—many of them, at least—the same invoices, in other words, that Mr. Luce, and, in fact, the same source of information was open to Mr. Miller. We have copies of all of those invoices, and we have the originals, I presume, on file in Philadelphia.

Q. Well, have you any records from which you could give me, for instance, what they actually paid for the Worthington pump in that station?

A. We had the checks and the invoices that we paid. I haven't got them now, because they were returned to Philadelphia several months ago, after Mr. Miller got through with them.

Q. Then that information is not available here?

A. No, not unless you take it off of the books. Now, we have got the books; all of the books are right here. You will understand, of course, now, I don't know anything about the accounts of the company, because they are not under my supervision; they are not under my care; I haven't got anything to do with that. I furnished the data, you understand, and those things all originated
255 under me here. In other words, they pass my scrutiny, you understand, before they are sent to Philadelphia, but they are sent there, and no other account is kept of them, and checks made and paid from Philadelphia. All of that, however, we are in position to show. The books of the company are here, and the accountant is here. You will have an opportunity to take up all that direct.

Q. You don't know what any of those items cost, and you haven't that information yourself?

A. No, I don't. It seems to me that the invoice, the first cost of the Ada pump was about $15,000, I believe.

Q. That is the Snow pump?

A. Yes. That was without pipe, you understand—auxiliaries. Perhaps some auxiliaries may have been included in that, but without setting, you understand, or anything. I believe maybe the freight was paid on top of that, possibly. I rather recall that the invoice covering the actual boilers here, without stack or steam pipe or anything of that kind, was perhaps $3,200. A few of those items seem to be fresh in my mind, but that is only from memory, you understand, and I wouldn't rely on it as being correct.

Q. Well, have you the amount of money spent by the company in laying the mains which have been laid since——

A. Well, we have that; that is all made up monthly, you understand, and sent in to Philadelphia. That is on our books.

256 Q. That is what I mean, the books will show that?

A. The books will show that.

Q. Now, the Beaver Pond station was constructed before you came here, I believe?

A. Yes, sir, it was.

Q. And none of the work out there has been done since you came here, has it?

A. Well, except the repairs we made on it. The repair work, but the original work was all done before my time.

Q. Well, the repair work was not in the way of renewals, but repairing the machinery that is already there?

A. Well, yes, and renewals. We renewed the boilers since the pumping station was built, and we have reset them, I believe, twice.

Q. You have put in new boilers since you have been connected with the company?

A. Yes; the old boiler went out of use many years ago, and two boilers have taken its place since that time.

Q. That is an eighty-horse-power boiler and a hundred-horse-power boiler?

A. Yes, sir.

Q. What did you pay for those boilers, Mr. McCarthy?

A. Well, I can't say. They were bought before my connection with the company. It seems to me that it was in the neighborhood of $900 for that.

Q. For each of them?

A. Yes. Now, that is only my recollection. I don't recall just what—exactly what they cost, but I think it was in the neighborhood of $900.

257 Q. Mr. McCarthy, you have stated, I believe, that you agreed with Mr. Alvord on his estimate of the value of the springs. Is that correct?

A. Yes, sir. You mean the gravity springs?

Q. Yes.

A. Well, it includes the Ada spring too.

Q. Including the Ada spring.

(No answer.)

Q. Mr. Alvord, I believe, arrives at the value of these springs by capitalizing the amount that it would cost to get water from new

springs in addition to what it would cost to get water from the gravity supplies. That is true, isn't it?

A. No, I don't believe that is quite true. I believe, if I remember his reasoning, he gets the value of those springs by reason of their position to furnish water to us cheaper than from the next most nearest known available source.

Q. And capitalizing that amount?

A. Yes, yes.

Q. You didn't understand me, or maybe I didn't make my idea clear.

(No answer.)

Q. And he arrives at that by assuming a station duty of 40,000,000 feet-pounds per 1,000 pounds of dry steam. What is meant by "station duty," Mr. McCarthy?

A. Well, I don't know that I can go into that very thoroughly. I have made these calculations. I have made several duty tests on our Ada pumping station, but it has been several years ago. Those calculations are calculations used more by mechanical engineers than water works superintendents. The rules governing
258 them are simple, and I could familiarize myself with them and explain perhaps very readily what is meant by it, but it simply means roughly, I suppose, that for each thousand pounds of dry steam there is that much station energy—in other words, a thousand pounds of dry steam is a thousand pounds of water evaporated into steam.

Q. And that would produce 40,000,000 foot pounds of energy?

A. Yes, station energy.

Q. Now, the cost of that is governed by how much coal it would take, naturally, to reduce a thousand pounds of water to that much steam, isn't it?

A. That would naturally follow.

Q. Have you any records of your Ada pumping station that would show what that is?

A. Yes, we have, I believe. I don't know that we have got it in that form, except with those duty tests, you understand. I believe I have got that of our Ada pumping station, one or two tests we made ourselves and some made by the representatives of the Snow Pump Works.

Q. Those tests that you have show that Mr. Alvord's assumption of 40,000,000 pounds for 1,000 pounds of dry steam is not correct, is it?

A. Well, I don't know. I don't recall what our station duty was —what duty we got out of our pump at Ada by way of comparison. I don't know just what they were, I am sure.

259 Q. Mr. Alvord assumes, too, that 5 pounds of water is evaporated by every pound of coal. They it would take 200 pounds of coal to evaporate this 1,000 pounds of water which he applies to the 40,000,000 foot-pounds of energy, wouldn't it?

A. I presume that would be correct.

Q. Yes. And 100 pounds of coal, then, would have a station duty of 20,000,000 foot-pounds of energy, wouldn't it?

A. Well, I haven't checked those things, but I presume that would be right.

Q. Well, if 200 pounds at 40,000,000, 100 pounds would have 20,000,000 on the same basis?

A. Yes. I don't know that that would be true. Of course, it would be true if the plant was designed for that capacity; it wouldn't be true to take a 40,000,000 foot-pound plant and convert it to 20,000,000, because the percentage would run higher as the duty became less.

Q. It would be the same percentage all the time at the Ada plant, wouldn't it?

A. No, it wouldn't. It ain't true of any plant. If you are running a plant in order to get the best economical conditions it is necessary to operate that plant at about its rated capacity, you understand. If you operate a plant that is rated at a certain figured at one-third of its capacity, why its economical operation is cut down perhaps ten per cent.

Q. Well now, how have you operated the Ada plant?

A. Well, we have operated it as we could on the water
260 conditions. That is how I know that it can't be operated running at less than its nearly normal capacity as cheaply as it can be operated at its full capacity, gallon for gallon of the discharge.

Q. Then, if your Ada plant hasn't been operated, for instance, during the year 1915 at its average capacity, it would show less station duty per 100 pounds of coal than Mr. Alvord's estimate would show, wouldn't it?

A. Well, I don't know; I don't know how Mr. Alvord's calculations would compare with our station duty.

Q. I understand that.

A. You mean theoretically?

Q. Theoretically; yes.

A. Theoretically, yes, I presume that would be true.

Q. Now, if your operations at Ada show that you got, during the year 1915, 43,800,000 pounds of energy out of each 100 pounds of coal instead of 20,000,000, Mr. Alvord's estimate that it would produce 20,000,000 must be incorrect, mustn't it?

A. Well, I don't know that that is the condition.

Q. Well, I say, if that is the condition.

A. Yes, if that is the condition.

Q. You can ascertain if that is the condition very readily, can't you?

A. I presume so.

Q. You know you can find out how much coal you used and how much water you pumped?

A. Yes, sir. I might say here, before we get too far past this, that there is no station records that we keep, you under-
261 stand, that will indicate what our station duty is. That is a mathematical insight, you understand, that you get into that part of it. That is going much further than we do. We simply take the number of pounds of coal we use there daily, and we also keep a record of the number of gallons of water we receive,

as indicated by the pump counter. When we get into engine duty, that is a different proposition. That is a very fine, delicate test, made by men that understand the business, and it is usually carried on under precise conditions, and very different from average working conditions, you understand, as found in the ordinary, average plant, of every day use.

Q. But the station duty that you are going to get out of your pumping station is going to be in its every-day use, isn't it?

A. Yes.

Q. And if you do get, as a matter of fact, in your every-day use, out of your pumping station at Ada, more than twice as much station duty as Mr. Alvord calculates on, then his estimate of $50,000 on these springs is based on a false assumption, isn't it?

A. Well, I don't know. Let Mr. Alvord answer that for himself.

Q. You testified in chief that Mr. Alvord's estimate of the value of these springs you approved, and you approved the way he arrived at that, and approved the figures that he made?

A. Yes, from his reasoning.

262 Q. Well now, part of that reasoning was to assume that 100 pounds of coal would make 20,000,000 foot-pounds of energy?

A. Yes; I don't recall just what it was.

Q. And if that assumption is not correct, then the whole reasoning falls to the ground, doesn't it?

A. Well, I can't say that it does. That particular feature of it isn't the whole thing. It depends in a great measure on what kind of pumps you put in to get that duty. You might put in a low-grade pump that could be bought for rather a cheap figure on which you wouldn't get the station duty that you would on a high-grade pump that would cost a great deal more money. I don't know how Mr. Alvord figured this.

Q. How did you figure it?

A. I say I assumed his reasoning, you understand. I had my idea of the value of those springs prior to Mr Alvord's reasoning. My idea was that they were more valuable than he placed them. But taking his reasoning, you understand, without going into the minor details of his method of arriving at it, I was willing to concede that they were worth his figures rather than mine.

Q. Well now then, Mr. McCarthy, for the year 1915, your average daily pumping of water at the Ada spring was 446,000 gallons, I believe?

A. That is the average daily pumping. Well, I haven't got it in that shape here. I have simply got the number of million

263 gallons pumped monthly, and the total for the year. I show here—I have in my memorandum here a range of from 7,000,000 minimum in February to 18,000,000 in June and July. I have got mine stated here in the nearest million; not fractional parts of millions; making a total of 163,000,000 for the year.

Q. All right. We will take those figures, then.

A. Yes.

Q. You pumped, then, 163,000,000 gallons of water out of the Ada station during the year 1915, and you used 1,774 tons of coal for that purpose. Isn't that true?

A. Well, I haven't got the coal consumption here. I haven't taken any note of that.

Q. Well, assuming that you used 1,774 tons of coal to pump that 163,000,000 gallons of water, what was the station duty per hundred pounds of coal?

A. I couldn't tell, Judge.

Q. Couldn't you make that calculation?

A. Not now.

Q. Well, I will ask you if it wouldn't be 43,800,000 foot-pounds per 100 pounds of coal, and 87,600,000 per thousand pounds of dry steam.

A. I couldn't tell you, I am sure; that would all be based on the evaporating power of the boilers. I haven't even got—I don't remember what horse-power ever we developed down there at this present moment.

264 Q. What difference does that make, what horse-power you develop? You have got the amount of coal you used and the amount of water you pumped. Can't you tell how much energy from that——

A. Oh, yes, you can tell how many foot-pounds it took to raise that amount of water that distance, but at the same time you don't get your dynamic in there.

Q. What is the dynamic?

A. That is the frictional resistance.

Q. That would be as much in one place as it would in another?

A. No, it depends on the amount of water the pump is discharging. It is greater as the discharge becomes greater, and less as it becomes less.

Q. In this calculation Mr. Alvord assumes that the lift for the Ada station is 575 feet, which includes, I take it, in this calculation, the force you call dynamic force, or friction. Is that correct?

A. What is the question again please, sir?

(Question read.)

A. No, that wouldn't include the dynamic force—include all of the dynamic pressure. It might include it when the pump was running slow, as it usually runs in the summer, on account of—in the dry season, when pumping a small quantity of water. My memory is that our Ada pump operates against about 235 pounds pressure when discharging a million and a half. Now, in the

265 latter instance, it would be operating against a difficulty—to a vertical height of 808 feet, instead of 575, as Mr. Alvord notes in his report. The actual vertical height between the top of the twin tanks and the floor of the pumping station at Ada is 536 feet.

Q. Including the dynamic force, then, it would be equivalent to a rise of 800 feet?

A. Yes, when pumping at its full capacity.

Commissioner Northcott:

Q. And when pumping at 500,000 gallons a day, what would it be?

A. Pretty close to Mr. Alvord's figure. I think it would exceed that a little. Let me see. I think the pump operates against 240 pounds.

Judge Ritz:

Q. I understood you to say 250.

A. Well, about 235 or forty; I guess 240. I don't mean that either. I mean 240 now is when the pump is standing still, I believe, without any movement at all. Of course, now, as the pump starts to move and is boosting water towards Bluefield, this pressure increases as the speed of the pump increases, until it reaches its maximum capacity, of about 35 or 36 revolutions a minute, when the pressure against which it is pumping equals about 350 pounds.

Q. I understand that, Mr. McCarthy, but I understood you to say that when it was pumping 500 gallons a day it operated against a pressure of 250 pounds.

A. I suppose 250 would be about right.

266 Q. What height would that be equal to?

A. It would be 577, so that must be what Mr. Alvord figured on was the usual——

Q. Then Mr. Alvord's calculation in that regard is about right?

A. About right.

Q. 575 feet. And in his calculation of the proposed Bluestone impounding plant, he uses 425 feet. Is that about right?

A. I presume that is about right.

Q. Then your pump at Ada would operate against 150 feet elevation more than the Bluestone plant?

A. Yes, if those figures are right.

Q. And would, of course, cost more to raise a ton of water 575 feet than it would 425, wouldn't it?

A. Naturally; yes, sir.

Q. Then, calculating between the cost to produce water from Bluestone and to produce water from Ada, it would be in favor of Bluestone instead of Ada, wouldn't it?

A. Well, it would be assuming that there was no plant at either place, you understand. Of course, we have got a plant at Ada; we operate from Ada. Now, we don't know what we have got to go against in Bluestone. This is assumption, of course, and we are assuming——

Q. And your report of $50,000 valuation is all based on that assumption, isn't it?

A. On that assumption, yes.

Q. And taking that assumption to be true, the Ada plant,

267 instead of being a valuable asset, it is the reverse, isn't it, as compared with the Bluestone proposition?

A. No, I think not.

Q. It would cost more to get the water from there than from the Bluestone plant?

A. Yes, but you get better water.

Q. That is the difference?

A. You get spring water in one instance; you get creek water in the other instance.

Q. You don't base your idea of the value of the Ada springs on the difference in cost between getting that water here and the Bluestone water at all?

A. I say I agreed with Mr. Alvord here, after reading his reports, that his figures were all right.

Q. Well now, Mr. Alvord's report is, as stated in the beginning, on this theory, to capitalize the difference between the cost of producing water at one place and the other place. That is true, isn't it?

A. Yes.

Q. And he fixes the value of the springs on that basis, doesn't he?

A. Yes.

Q. Now, if you have to raise the water 150 feet further from the Ada springs than you do from the Bluestone plant, it would cost more money to produce water from Ada than it would from Bluestone, wouldn't it?

A. Well, I don't know that that is a fair comparison.

Q. Isn't that the exact comparison Mr. Alvord made upon
268 which all of his calculations are based?

A. No, I rather disagree with you, Judge. In the first place, Mr. Alvord has figured a much larger supply, you understand, from Bluestone than we get from the Ada. I think that should be taken into account too.

Q. Well, I suppose he took that into account, didn't he?

A. Well, he may have done it.

Q. And didn't he arrive at the conclusion, and isn't it stated in his report, that it would cost $84.70 per million gallons to produce water from Ada, and $71.75 to produce it from Bluestone, per million gallons?

A. Yes.

Q. Filtered water from Bluestone. That is his calculation here, isn't it?

A. I presume that is true.

Q. And his conclusions are based upon that calculation?

(No answer.)

Q. Now, if that is true, that it cost eighty odd dollars per million gallons to get the water from Ada, and seventy odd dollars to get the water from Bluestone, why is the Ada spring more valuable than a spring of the same kind on Bluestone would be?

A. Well, I don't believe it would be any more valuable.

Q. It wouldn't be as valuable, would it?

A. Well, if conditions are the same—that is, the condi-
268½ tion of the water is the same, I would say on account of having to pump through less vertical height, that the Blue-

stone spring would be the most valuable, other things on the same plane.

Q. And if you had a plant on Bluestone, such as has been proposed by Mr. Alvord, adequate to supply the needs of the city, the Ada plant would immediately become obsolete, wouldn't it, as a matter of fact?

A. Well, if you had, yes.

Q. If you spend this $240,000 that you talk about?

A. Yes, but I doubt very seriously whether a plant of that size could be had on Bluestone for that money. I believe Mr. Alvord's figures are a little bit too small.

Q. Well, whatever it might cost, assuming that it would cost a million dollars, that is not material.

A. Mr. Alvord's figures are based on four miles from Bluefield. He would have to go six or seven, probably, to begin with; and the conditions under which he would impound would be much more serious at the place which he proposed, on account of the cavernous condition of that particular section.

Q. Whatever the cost might be of such a plant, when you got that plant the Ada plant would be obsolete, wouldn't it, from the very fact it would be to- expensive to get that water to Bluefield?

A. Well, no, I don't think so. It might be cheaper at some time to operate the other plant, but, at the same time, no water
269 company in the world ever threw out a plant, you understand, simply because you could pump from one plant cheaper than the other. You understand that this Bluestone plant is for no other purpose at all only to take care of the needs of the city of Bluefield at times when the other plant, not only the Ada plants, aren't able to supply; because there is not the water in Bluestone river, and it can't be impounded, to supply the needs of this city by itself—that is, within human possibility and with anything like a reasonable cost. I explained to you that the railroad company was short of water long before they put in their water supply on the Elkhorn mountain to fill their engines with, taking the water from Bluestone they have had to impound themselves. Now, it is only the surplus waters that we would be able to take care of and to use from Bluestone; and the valley in which this impounding would be done is too narrow and too small to impound a quantity sufficient and large enough to take care of the needs of this city. It couldn't possibly be done.

Q. You would only have to use this impounded water during dry seasons?

A. Yes, but understand, you are isolating the Ada plant; you are putting that out of commission.

Q. Yes. You would only have to use this impounded water during dry seasons?

A. Yes, sir.

Q. Now, wouldn't the ordinary flow of Bluestone during
270 wet seasons, without any impounding, furnish sufficient water?

A. The flow of Bluestone through four or five months of the year

is only large enough to take care of the railroad company's needs. Now, at this particular time, Bluestone river is very much higher and very much more water in it than the railroad company needs or that we would need, you understand, but that don't cut any figure; we don't need that water.

Q. Now, that is the very water that you would impound and keep till you did need it?

A. Yes.

Q. And the flow of Bluestone during the year is ample to take care of all of the needs of the city of Bluefield and the railroad and everybody else, isn't it?

A. Yes, if it could be impounded it would be.

Q. And distributed over the year?

A. If it could be impounded and was distributed; yes.

Q. What do you calculate would be the capacity of this impounding plant you are going to put on Bluestone?

A. Well, we figure on taking care of the city for twenty years, I presume. I think it would be a bad plan to figure on less than that. If the city continues to grow as it is now—as it is now growing, I presume that the plant by that time would have to furnish right up to its full capacity.

Q. Well, what would be the capacity?

A. Two million gallons a day.

271 Q. This plant you were figuring on on Bluestone would furnish 2,000,000 gallons a day?

A. Yes, sir, during dry weather.

Q. And during wet weather it would furnish that much more than you need?

A. Just during wet weather. It would interfere with the Norfolk and Western use of water.

Q. If you could furnish 2,000,000 gallons during the dry weather today, why couldn't you furnish it during the wet weather?

A. We may be working on the wrong hypothesis, but I understand where another party has the riparian rights to a stream we would only be entitled to the excess waters of that stream.

Commissioner Northcott: Waste and unappropriated.

A. Yes, waste and unappropriated. So that I don't know—You will understand, too, that really cold weather in this part of the country, where these streams head up into the mountains, are dried up during the winter seasons, very much the same as they are dried up during the summer by real dry weather. We find that is very much true of our springs; one week of real cold zero weather will dry up our springs very much like a real dry spell during the summer season will do; and that applies to our streams, because they are supplied very largely from these springs.

Judge Ritz:

Q. You don't have a week of zero weather every ten years

272 in this country, do you?

A. We are frequently handicapped by cold weather in this country. There are several seasons of it each year. It don't make

any difference if it only lasted a week, if we got out of water during that time it would be serious.

Q. But this impounding plant could be used to supply that deficiency then just the same as it could during dry weather in the summer, couldn't it?

A. It could be; yes.

Q. Mr. McCarthy, referring to the Beaver Pond springs, there is an item for pumping station and other appliances at that spring. That has been discontinued, hasn't it?

A. Since the inventory has been taken it has been discontinued.

Q. And it is now entirely obsolete?

A. Now, I will say that the equipment there has been discontinued. Of course, the spring is not obsolete.

Q. Oh, I don't mean the spring; the station.

A. Yes, the station only.

Q. I understand you are still pumping from the spring from another station?

A. Yes, sir.

Q. But the station is obsolete?

A. That is true.

Q. And you are pumping that water now with electric power?

A. Yes, sir.

Q. Is that very much cheaper than pumping it with the steam power that you formerly pumped it with?

273 A. Well, we haven't had the opportunity to test that out yet. I am not able to say which is going to be the cheapest. I presume there may be a little advantage—or, at least, I am told now by the Appalachia company that they will be able to furnish us power cheaper than we could furnish it by steam. I believe they can furnish us power cheaper than we could furnish power there, because we had to haul the coal; but I don't know how it will compare with our steam plant at Ada. I haven't been able to make any comparisons yet. We have no measuring devices on the pump; we don't know how much water we pump. We have a meter ordered for that purpose, and expect it in every day, and after the installation of this station meter we will be able to tell pretty closely what the difference in the cost between the two stations will be.

Q. What is the rate at which they furnish you power for that plant?

A. Well, really I can't say. I think perhaps it is 5 cents a kilowatt for the first 500. You asked me what rates we were paying for this current. I might say that the operation of this plant is not a proper item in connection with the plant of the Bluefield water works. That plant is really a plant that is located in the state of Virginia, and it is and will be operated by a different company.

However, I have no objection to answering the question as
274 to what rate we pay for this current on this contract. I can't recall exactly what the figures are, but my recollection is it is from 5 cents a kilowatt for the first 500, and 2 cents a kilowatt for the next 10,000, and a cent and a half a kilowatt for the following 40,000, possibly.

Q. And you never have gone beyond that yet?
A. No, we never have reached that.
Q. You say this plant is operated by a separate company?
A. Yes.
Q. But it furnishes water to the Bluefield Water Works and Improvement company?
A. It furnishes water to the Bluefield Water Works and Improvement company.
Q. And the cost of operating this Beaver Pond plant you have included in your items for expenses all the time, haven't you?
A. Well, the cost of operating the Beaver Pond plant has been a proper charge to the Bluefield water works; they don't operate that plant.
Q. Now, Mr. McCarthy, the Beaver Pond spring doesn't belong to the Bluefield Water Works and Improvement company?
A. Yes, sir, the Beaver Pond spring belonges to the Bluefield Water Works and Improvement company.
Q. And the Bluefield Water Works and Improvement company employes this other company to pump that water for it to Bluefield?
A. Yes. But in addition to the waters from another spring that belongs to another company.
275 Q. In other words, the other company was simply organized by the Bluefield Water Works and Improvement company in order that they might exercise the right of eminent domain in Virginia?
A. I think so; I think that is the situation.
Q. And that is really a component part of the Bluefield Water Works and Improvement company?
A. Well, it is a separate company. We didn't necessarily have to set ourselves up as a public service corporation in Virginia, because we had nobody there to supply water to—at least, at the present time—but one of the things that we did want to avoid was to—the reports that are made to the Interstate Commerce Commission. We didn't want to get hooked up between the two states so as to have those lengthy and unnecessary combinations, you know, that would be a source of annoyance.
Judge Sanders: I wanted to correct that statement that it was organized to exercise the right of eminent domain.
Q. You have never exercised that right; that has all been by agreement of the parties?
A. Yes, sir.
Q Then the fact that there is a separate corporation over there is not at all material, so far as fixing these rates is concerned?
A. No. Because the Bluefield Water Works and Improvement company has got to pay that expense.

Commissioner Northcott:

Q. You say you have never gotten the benefit of this in-
276 crease in plant at the Beaver Pond Bailey plant?
A. Well, not properly at this time. We will be in posi-

tion to put the plant in complete commission in a few days. To make the story short, I will say, to begin with, that the control panel that operates the pump is not satisfactorily adjusted to work automatically, to begin with; and neither has the Venturi meter that we ordered from the commission been placed in position. It has been ordered for a number of months, but it has not been received yet.

Q. How much additional supply would that give you?

A. I presume it would give us the combined springs, about 400,000 gallons in dry weather.

Judge Sanders:

Q. In addition to what you are getting now?

A. Yes. I say combined springs meaning the Beaver Pond spring and the Bailey spring, would give us about 400,000 gallons additional to the Ada springs and the gravity springs.

Judge Ritz:

Q. But you have been getting some of the Beaver Pond spring?

A. Well, very little; just a little, because we have been running it some, but not very much.

Q. That 400,000 gallons would be practically in addition to the present supply?

A. Yes, yes.

Q. Now, Mr. McCarthy, the water pumped from Ada is procured from springs, I believe you stated, up in East River Moun-
277 tain—at the foot of East River Mountain and up in the mountain?

A. Yes, sir.

Q. What is the elevation of those springs as compared with the Ada pumping station, and as compared with the twin tanks?

A. The elevation of the twin tanks is 2,810 feet. The elevation of the Ada pumping——

Commissioner Northcott:

Q. What is your base line on that?

A. That is above sea level. The elevation of the Ada pumping station floor is 2,274, I believe. The elevation of the Ada spring would be about 2,360 feet. I have measured; I don't see it shown on here. Yes, here it is; 2,356 feet.

Judge Ritz:

Q. Now, the other springs, up in the mountain, from which water is pumped at Ada, what is the elevation of those springs?

A. The elevation of the No. 18 spring, I should say, is 2,795 feet. The elevation of No. 17 spring, 2,811 feet. The elevation of No. 16 spring is 2,774 feet. The elevation of spring No. 19 is 2,947 feet. The elevation of No. 14 spring would be 2,932 feet. The elevation of No. 13 spring would be 2,828 feet; and the elevation of No. 12 spring would be 2,929 feet.

Q. Then all of the water from those springs is collected at the lower level at Ada and pumped from there to the twin tanks?

A. It is collected at the Ada spring, and it flows with the
278 waters of the Ada spring to the Ada pumping station, and is then pumped to the twin tanks.

Q. Those springs are practically on the same level with the twin tanks, aren't they?

A. Well, they are not—they are some higher.

Q. And some lower?

A. Yes, some of them are—there seems to be four of them higher and two of them lower, and one practically at the same elevation, 2,811 feet.

Q. Mr. McCarthy, would it be practicable to collect the water from those springs at a point near the same elevation as the twin tanks and pump it from an electrically operated station from there, without allowing it to run to the Ada spring and then pump it up the hill?

A. No, I don't believe it would be.

Q. Would it be practicable to operate the Ada pumping station by electric power?

A. Well, I suppose that it could be operated electrically; but it might be understood that when this Ada station was built there was no thought of electric power here such as we have got now. We had no idea, and the Ada station was built and designed as a steam station. It was also built and designed originally to furnish electric power to Beaver Pond spring, to furnish that with current to operate electrically if at any time we chose to do it, or maybe any other distant point that we might wish to furnish current and generate it ourselves.

Q. You say you designed the Ada station for the purpose
279 of generating power to be furnished to Beaver Pond?

A. Yes, sir, that was the intention. There was no thought —this idea of harnessing New River for power wasn't even dreamed of at that time, so far as my knowledge takes me.

Q. Now, what I want to ascertain is, would it be practicable to convert the Ada station into an electrically operated station? By "practicable" I mean would it save money in the operation sufficient to justify the conversion of it?

A. Well, I can only say this, that I have had Mr. Gregory, who was an electrical engineer employed by the Appalachian Power Company to solicit new business, to see me a number of times with regard to furnishing power for this Ada station, and I have explained to him the conditions which we operated under, the equipment that we had there, and what it cost us to operate; and he was never able to state positively that he could make any particular difference in the cost of operation by electric current over that of our steam plant. That is, the figures that he gave me were not at all figures that would indicate to us that it would be cheaper to operate electrically there over that of a steam plant. I would say that we have got a strictly up-to-date steam plant. It is small, it is true, but it is a very good plant, and I believe it is an economical plant to operate. We

get our coal cheap, and the expense of operation is not a big
280 one, and the Appalachian Power Company has never made me any figures—— I have given them the cost down there, what we were doing and what it cost us, and he has always taken them and said, "Well, I will let you know later;" and while I have seen him later, he has intimated in both instances that they had nothing that was particularly attractive to us, and the matter was dropped; and so I presume that on account of the distance that a steam plant would be nearly as economical to operate as an electric plant at that point.

Judge Ritz: Well, I think that is all I want to ask him right now.

Commissioner Northcott: I just want to ask Mr. McCarthy one question.

Q. What is the elevation of—— What is this new station, the subsidiary company?

A. The John A. Bailey spring.

Q. What is the elevation of that spring?

A. Beaver Pond, I would say, would be about 2,443, I would think. It would be 20 feet lower, I suspect, than the Beaver Pond spring, so that the John A. Bailey spring would be 2,424.

NOTE.—At this point, it being 12.30 o'clock p. m., a recess was taken until 2 o'clock p. m. of the same day, at which time this hearing was resumed as follows:

281 Judge Ritz:

Q. Mr. McCarthy, there are some items in this inventory that has been filed under the head of "improving springs." Do you know, or do your records disclose, what the actual cost of the improvements made to the springs was?

A. Now, we have a statement here, Judge, that will enlighten us a little in that respect. Now, from 1909, including the year 1909, which begins on January 1st, 1909, we spent on springs, rights of way, and purchases, $4,689.03; 1910, we spent $11; now, 1911, we spent $1,775; in 1912 we spent—Well, it don't show anything on 1912. None shown in 1913; none shown in 1914. Now, that is additional to plant, I suppose you—That is not for maintenance, you understand; that is just original investment.

Q. That is what I am driving at.

A. That is for the gravity springs alone.

Q. Now, what springs were improved with those amounts, and what improvements were made to them?

A. Well now, I couldn't give you that.

Q. You were in charge of the company's affairs during that time?

A. Yes, sir. We worked on a number of those springs, you know, at the same time. That is, I mean to say that we were working on a series of them.

Q. Well, what ones were they?

282 A. Well, during the time we worked on the Ada spring, the mountain springs, and the Ada gravity series—new springs.

Q. Now, Mr. McCarthy, at the time you went to work as superintendent of this company, was there any improvement done to the Ada spring?

A. Not much, no. The water was being taken from Ada spring, but there was no especial improvement at the spring property itself; a little, of course, but it was small; no large investment there. That question, of course, would not include the dam or reservoir.

Q. No, I understand; I am just talking about the spring.

A. Yes.

Q. And since that time have you made any improvements at the spring?

A. Yes, very much.

Q. What improvements have you made there since, and at what cost?

A. That would be maintenance.

Q. No, I don't mean maintenance charges. I mean the items that are included in this inventory.

A. Well, we have—I don't see that the gravity springs has been separated from the Ada spring. I believe our improvements here are shown as improvements to springs generally, and we have nothing separated. We have spent, however, on the gravity springs and improvements, which may include the Ada spring maybe, $33,500.

Q. Which you have spent on the improvement of the springs?

A. Yes, sir.

283 Q. Is that all of the springs you have?

A. Well, I take it that it is; I take it from this statement.

Q. Now, what does that item of $33,000 include, getting it in terms used in this inventory?

A. Well, it would include the fencing of the spring property, the ditching, infiltration lines, the placing of these concrete boxes or basins around the spring, and the clearing of the land and the laying of the pipe from the mains to the spring. That would include all of the work done at the springs to bring them up to where they stand at this time.

Q. Now, does that include the purchase price of the springs themselves?

A. No, I suppose not; I would hardly think so. I think this first item that I gave you would be the springs and rights of way, which amounted to, in the years that I have mentioned since the first of the year 1909 up to the present time, $6,475.

Q. That was for the purchase of the springs and rights of way?

A. Yes.

Q. Now, what springs and rights of way did you purchase with that $6,000?

A. Well, we purchased the Estill Bailey spring, near the Ada pumping station, the one put out of business with sewage, and we purchased——

Q. How much did you give for the Estill Bailey spring?

A. I think about $1,500. I am only—I am just guessing
284 at that. That is all shown, I think, in Mr. Alvord's report, but I think it was about $1,500. Now, we purchased a number of springs; I don't recall the number; six or seven, I believe, in the vicinity of Ada spring above the Ada spring, the waters of which now flow to the Ada spring by gravity.

Q. How much did you pay for those?

A. Well, they were varying amounts; I wouldn't be able to say. I have no memorandum with me. I have no idea; from a few hundred dollars up each.

Q. From whom did you make those purchases?

A. We bought three from Thomas P. Morgan; we bought one from R. H. Bailey. I believe we bought one from—(Witness refers to map.)—That last one I gave you was Robert P. Bailey, wasn't it?

Q. Robert H. Bailey.

A. Robert H. Bailey. The next one from B. P. Wilson; the next one from Walter Bailey.

Q. Now, did you purchase any other springs during that time?

A. I don't recall that we did, unless perhaps it was the Jarrell spring. That might have been bought in the year 1909; I am not positive about that.

Q. Do you know what you paid for that?

A. I believe we paid $4,000 for it.

Q. That was for the farm and the spring?

A. No, no. No, just the spring and an acre of ground.

Q. Then you subsequently bought the farm?

285 A. No, we didn't buy the farm. We didn't buy the Jarrell farm. We don't own any part of it except the acre of ground.

Q. Where is the Ruble farm?

A. The Ruble farm is below the Jarrell spring, on the Jarrell spring branch. It was bought to secure the water rights on the branch.

Q. From the Jarrell spring?

A. From the Jarrell spring.

Q. Mr. McCarthy, the item of $33,000 that you mentioned as being the amount spent for improvements to springs, did that include any of the cost of maintenance of the springs during the time?

A. No, sir, no, sir.

Q. Now, that includes the clearing of the ground, the putting in of the concrete basins, or whatever they are called, the infiltration lines, and the lines leading from the springs, as I understand, to the mains?

A. Yes, and perhaps various other sundry articles, you know, that I haven't got in mind at this time.

Q. Now, what do you mean by the item of the pipes leading from the springs to the mains? Take the Ada spring, for example.

A. Well, the Ada spring I didn't have in mind when I said that.

Q. Well, I was just giving that to get an idea of what was meant by that.

A. Yes. There would be very little of that at the Ada
286 spring—a very small connection between the spring itself, where it issues from the ground, and where it enters the pipe; you know; but what I had particularly in mind was the work done away from the springs, you understand—away from the spring properties. I am not sure now whether that item of pipe-laying from the spring proper to the trunk pipe line would be included in that statement. I don't believe it would. I believe that would be included in pipe lines.

Q. That is what I wanted to get. You have an item of pipe lines, in your statement, haven't you?

A. Yes.

Q. Now, the lines leading from each of these springs. As I understand, the water from each of these springs is collected into a basin? That is correct, isn't it?

A. Yes, sir.

Q. And then conveyed from there to your main?

A. Yes, sir.

Q. You have, for instance, a gravity spring main that runs out to these gravity basins?

A. Yes, sir, trunk main.

Q. What I wanted to get at was whether that item from the gravity spring to the trunk main was included in the spring item.

A. No, sir, I don't believe that is included.

Q. That is in the pipe-laying item?

A. That is in the pipe-laying item.

287 Q. Then the item that you gave as $33,000 would correspond with the items 3, $14,645; 4, $19,231; 5, $137. Those three items are the items that are included in your item which you have just given as $33,000?

A. No, I would hardly think so. You see, I have given you that item of $33,000, but it only covers the period from 1909 up to this time, while, of course, those gravity springs, many of them, were in existence long before that.

Q. Well, how much was spent before that time?

A. Well, I couldn't tell; I don't know about that, I am sure.

Q. And you don't know how much was spent on them since?

A. No, I do not. And I am not certain—I am not positive about the lines, you understand, whether these individual lines leading to these springs are charged to the spring improvement itself or not. I would have to look into that before I could answer that intelligently; and I don't remember how Mr. Alvord accounts for that, whether he has a separate item for it or whether it is charged in with the spring.

Q. Have you any information as to the cost of the pipe line from the Ada spring to the city of Bluefield?

A. No, I have not. We have it, too, I suppose, but I haven't it available just at this moment.

Q. You have a record of that?

288 A. Well, I don't know whether we have or not. We have the books of the company here, from which I presume that data can be given, but I haven't got it so I could give it to you at the present time.

Q. Have you any data which would show the total cost of all the pipe lines of the company?

A. I haven't got it. We may have it, but I myself haven't got it at hand.

Q. Mr. McCarthy, you stated that in your judgment it would not be practicable to collect the water from the gravity springs above the Ada spring at a point approximating the elevation of the twin tanks and pump it from that point to the twin tanks. Why would it not be practicable?

A. Well, the flow from those springs is irregular; it would be rather difficult to put in a pump, I suppose, that could be operated economically. I mean by that a pump and a pipe line from it that would take the water from the springs in fairly wet weather would be much to- large for it in dry weather, and the dry weather flow is what really figures with us, and the amount would be too small, in my opinion, to put in a pump for that purpose and pipe line.

Judge Ritz: That is all, unless I have omitted something.

The Witness: I wanted to make one correction, if you please. I stated that I believed the Jarrell spring was bought in 1909. I believe it was bought several years earlier than that, and instead of
289 paying $4,000 we paid $2,000 for it.

Commissioner Northcott:

Q. Mr. McCarthy, what percentage of your services here are metered?

A. I haven't figured it up right lately, but I think it is somewhere in the neighborhood of seventy-one or two per cent.

Q. Are all the large services metered?

A. All of the larger services are metered, yes.

Q. And those that are not metered are the poorer classes of domestic consumers?

A. Yes, sir. We make it a rule to try to meter all those that are paying a dollar or more.

Q. What is your policy? Is it to eventually meter all the services?

A. Yes, sir.

Q. Isn't it your opinion that that would save a great deal of the demand?

A. Well, we figure now that there wouldn't be so much saved, by reason of the fact that most of these services that are not metered are services that are—that furnish water to people that have a hydrant in the yeard, for instance, where the use or waste of water is not excessive, and where we could easily check the waste of water. We think there is not much to be saved. We have saved a great deal by the installation of meters on the ordinary consumers. I think that is the only proper way to sell water, and I hope to see the day

when it will be metered soon; but just what saving would be effected by a complete metering I wouldn't be able to estimate just
290 at this time, but in my opinion it wouldn't be very large.

Judge Ritz: There was one thing I wanted to ask Mr. McCarthy that was suggested.

Q. You stated, Mr. McCarthy, that the plant at Ada that you put in for impounding the excess water supply there, you had been compelled to abandon by the city?

A. Yes, sir.

Q. I wish you would state who it was that compelled you to abandon it?

A. There was an order issued by the board, come to us through Mr. Kahle—I mean by the "board" the Board of Affairs of the city of Bluefield, who were the officers in charge of the city of Bluefield at that time.

Q. Have you that order?

A. No, I can't say that I could produce it, but we have got it, I presume.

Q. What did that order require you to do?

A. It required us to empty the water in the reservoir and not refill it until we were further ordered to refill it.

Q. And that was because it was thought to be polluted, wasn't it?

A. Well now, the order came to us arbitrarily. So far as I know, and I kept pretty close tab on it at the time this was done, there was no investigation made by the city as to the sanitary condition of that water. I myself believe that the water was all right; I don't think there was a thing wrong with it; and I further believe that the water can be maintained in this reservoir in good condition.

Q. You think Mr. Alvord is mistaken when he said it
291 ought to be filtered?

A. I don't recall that Mr. Alvord made such a statement. I do recall that he said in his opinion that the Ada water perhaps in the future would have to be filtered.

Q. Don't you recall that Mr. Alvord made the statement that water to be used from that impounding plant down there should be filtered?

A. Well, there would be no objections to filtering it. We will filter it, if the people want it filtered. I am not arguing against a filter, you understand; we will filter every bit of it if the people want it.

Q. And wouldn't that have disposed of the complaint of pollution of this water?

A. I presume that if there had been anything found wrong with the water that, of course, a filtration plant would have remedied it, but at the time this was done there was nothing wrong with the Ada water supply. I recall here distinctly, after putting in this Ada plant down here and erecting the two twin tanks, we immediately maintained here two separate and distinct water systems, so to speak. We had a—the gravity supply system, you understand, feeding into the Bland street tank, the Ada springs supply system, feeding into

the twin tanks, at a difference in pressure amounting to 35 pounds, say. Now, to a portion of the city of Bluefield those two supplies were entirely separate and distinct. The South Bluefield
292 people got no part of the water that was furnished this city by the Ada supply, neither did the East End, south of the railroad here, get any part of the water supplied by the gravity springs. A great deal of the fever conditions that existed here in Bluefield, continuing up till about a year ago, was in South Bluefield, you understand, particularly, and I believe there was really more fever in South Bluefield than there was in this other section of the town. Now, the trouble at this time, you understand, was as deep seated in South Bluefield, you understand, as it was in any other quarter of the town, leading me to believe that the condition of the water had nothing whatever to do with it. Further, I might say that after the installation of the city sanitary sewer through South Bluefield by way of Adams street and Graham that typhoid fever has been practically eliminated from this city; and I can further add that during the times fever was so much talked about in this city that I could see sewage with fecal matter in it floating on Adams street, the main thoroughfare of South Bluefield today.

Q. As a matter of fact, Mr. McCarthy, about the time that you got this order to drain the Ada springs reservoir there was a severe epidemic of typhoid fever in the city?

A. No. I don't believe we ever had a really severe epidemic of typhoid fever in this city, not considered as an epidemic. Typhoid fever was prevalent here, and it was common.

293 Q. We had three or four hundred cases here out of a population of 12,000?

A. Oh, no. We may have had three or four hundred cases in several years.

Q. I mean at one time.

A. I never heard of so many. I remember there was a good many; but South Bluefield was being supplied with a water the purity of which, I believe, couldn't be questioned, and it had just as much typhoid fever, or perhaps more, than the east end of the town, the supply to which was said not to be so good. I kept particular tab on that through the physicians. They had as much to do with it as anybody else. They seemed to believe that the water had something to do with it.

Q. As soon as they ceased using the water from this impounding station the typhoid fever ceased?

A. Oh, no, typhoid fever was about,—I believe there was just as many cases up to two years ago as there had been at any one particular period of the history of the city.

Q. When did you discontinue using that Ada spring reservoir?

A. Oh, I don't know. I believe about 1909.

Q. About seven years ago?

A. It was the year—I think a year after the report was made by a man named Stabler. A Government expert came in here and made a report on this water supply. I don't remember whether he

made that in the year 1908 or not, but it seems to me it was, and this reservoir was emptied the year following.

294 Judge Ritz: That is all.

Redirect examination.

Judge Sanders:

Q. Was any of the water from the impound of the Ada spring furnished to South Bluefield that you have referred to?
A. Never was, to my knowledge.

Judge Ritz: There is just one question, Judge, before you go on.

Cross-examination (resumed).

Judge Ritz:

Q. Prior to 1909, how many people were there living in South Bluefield?
A. Well, there were quite a number getting this water. When I stated South Bluefield I meant everything south of where the Government postoffice stands here now.

Judge Sanders:

Q. You say "this water"; you mean the gravity springs from East River Mountain?
A. Yes, sir.
Q. None of them got the water from the Ada springs?
A. No, sir.

Judge Ritz:

Q. Those people you speak of living in South Bluefield are largely the colored population living in huts and shacks just beyond the divide?
A. Oh, no; there was a good many white people living in South Bluefield then.
Q. There wasn't anybody living in what you know as South Bluefield now, was there?
A. Oh, yes, sir. Jefferson street was well built up; North
295 street had houses on it, a good many; Bland street was pretty well build up, a good many houses; and the same number of houses on Preston street that there is now.
Q. Nearly all the houses on Preston street were built by Oliver in the last year, weren't they—last two or three years?
A. Oh, no; Oliver has built a good many next to Bland; but the houses that run away back maybe a quarter of a mile from Bland there has not been many additions there.
Q. There are none of those connected with sanitary sewers?
A. I don't know.

Q. And there are none of these houses up here in Cooperstown and Jones' Hollow and all those places that were supplied with the gravity spring water that were connected with the sewer then or since?

A. I don't know how many were connected with the sewer, but I do know they were connected with the gravity spring water.

Redirect examination (resumed):

Judge Sanders:

Q. Mr. McCarthy, you have stated that the value of the property for tax purposes has been valued at $190,000. Who placed that valuation on the property?

A. Well, the Board of Public Works, I believe, have the authority for assessing public utility property.

Q. Do you know who returned, or do you know whether
296 anybody returned, this value to the Board of Public Works?

A. I don't think that value was returned by anyone connected with the company.

Q. Were you present at the time this assessment was made by the Board of Public Works?

A. No, sir.

Q. Were you there at any time, and did you take this matter up with the Board of Public Works at any time?

A. I have appeared before the Board of Public Works in several instances pleading with them not to raise this assessment any higher.

Q. What reason did you give for not wanting it raised?

A. Well, I concluded that for a company with the capital that this company had, and the small return they were getting on it, that they were paying enough taxes on it, you understand, with the present valuation, or the valuation at that time, the time I appeared before the board, figuring, as I thought, that the returns on a property on the capital invested in a piece of property really sets the value on that property; and we were only assessed—it is supposed to be assessed at least at its true and actual value. I assume that that makes its true and actual value for assessment purposes.

Q. Was that the way you presented that matter to the Board?

A. That is the way I presented that matter to the Board.

Q. Then, as I undersand it, if a larger return is yielded
297 to this company, the tax value will be increased proportionately?

A. I would say so; yes, sir.

Q. And in presenting this matter to the Board, you did so on the valuation which you thought, at the existing water rate, would yield a fair return to the company?

A. Well, I can't say that I did that. I thought the valuation was too high; I mean by that that we were paying really more taxes than we should pay, taking into account the amount of money that was invested by the company and the small net return we were getting.

Q. I don't know that the record is quite as full on this question as I desire it. You have been asked with reference to the pumping

station at Beaver Pond, as to whether it is now in use. I will ask you to state fully the facts in regard to this pumping station, which you say is not now in use—that is to say, why it is not in use, and how that water is brought here to Bluefield.

A. The Beaver Pond pumping station is not in use at this time. The water from the Beaver Pond spring, that was originally pumped by the Beaver Pond pumping station, is now allowed to flow by gravity about 2,600 feet westwardly to the John A. Bailey spring, where we have erected a small pumping station with which we expect to pump the waters from both these springs, the Beaver Pond spring and the John A. Bailey spring, into the city of Bluefield. I would say that this necessitated the moving or transfer of a
298 portion of the Beaver Pond pipe line, reading from the Beaver Pond pump toward the city of Bluefield, was taken up and relaid to make this change possible; and I might say that the right of way where the Beaver Pond pipe line was formerly laid is still owned by us occupied by us by a similar line, which will be used, and a portion of which is in use, to supply any needs that might be or might occur along that line where we now have no pipe line.

Q. Then the Beaver Pond spring is in West Virginia, and the John A. Bailey spring, to which that water is taken by gravity, is in Virginia?

A. Yes, sir.

Q. And your pumping station is at the John A. Bailey spring?

A. In Virginia; yes, sir.

Q. So instead of your pumping station being at that spring, it is taken from that spring to the John A. Bailey spring, and your pumping station is there by which the water is brought to Bluefield?

A. Yes, sir.

Q. And at practically the same cost. What have you to say about that?

A. Well, I would say probably at less cost.

Q. About how much less?

A. Well, we haven't had the pump long enough to figure on the cost, but it saves the item of coal haul which we had to Beaver Pond, about two and a half miles, over a very rough road. I imagine the operating costs at the two stations should be materially less, taking into account the amount of water pumped than
299 at the Beaver Pond station.

Q. Then that would be an item taken into account of expenses. Has this change increased or decreased the value of the company's property, is what I want to get at.

A. The amount of money shown in the Beaver Pond property in Mr. Alvord's inventory is so small—The property is listed at its value and then depreciated greatly. The new installation, you understand, is practically on the Virginia side, so that it will not materially add to the property of the Bluefield water works.

Q. Well, but whether in or out of the state of Virginia, as I understand, it is used in connection with this water supply?

A. Yes.

Q. And I believe you said that it doesn't materially change the values as fixed by Mr. Alvord?

A. No, not in this company. The company, I understand, I suppose the capital cost would be about twelve or thirteen thousand dollars, possibly.

Q. Well, that was capitalized and organized, as I understand you, for the express purpose of producing and furnishing water from these springs?

A. It was, and furnishing it to the city.

Q. And that should be added to the value of the company's property for rate making purposes, should it not?

A. Well, I don't know about that. I am not clear on that point. Of course, I believe the operating costs ought to be figured
300 in on this new plant, because the Bluefield Water Works and Improvement company will have to pay those operating costs as they get the water, I understand. That will be in the way of a rental, I suppose, that the one company will pay to the other to keep up the plant with.

Q. Are you a director of the Bluefield Water Works and Improvement company?

A. I am.

Q. Are you a stockholder?

A. Well, I am a qualified director; I have one share of stock.

Q. A qualified stockholder, you mean?

A. Yes.

Q. You own one share of stock, and that was transferred to you for the purpose of qualifying you as a member of the Board of Directors, as a director of the company?

A. Yes, sir.

Q. You have no beneficial interest, then, in the water company?

A. No, sir, not as a stockholder.

Q. What salaried officers has the Bluefield Water company?

A. Mr. John M. Wirgman is president; Mr. H. M. Kurtz is secretary and treasurer; and I am the superintendent, and Mr. A. L. Rhodes is the cashier, and Mr. William H. Triol is the bookkeeper.

Q. Are either of these officers named by you stockholders of the Bluefield Water Works and Improvement company?

A. Mr. Wirgman, Mr. Kurtz, Mr. Triol, and myself are stockholders and directors.

Q. What stock do you own—qualifying shares?

301 A. Qualifying shares; yes.

Q. Each of you owns one share of stock?

A. Each owns one share of stock.

Q. Transferred to you for the purpose of qualifying you to become members of the board of directors?

A. Yes, sir.

Q. Mr. Rhodes, is he a stockholder?

A. No, Mr. Rhodes is not a stockholder.

Q. Please give the salaries of each one of the officers named by you.

A. Well, I can only do that for myself and Mr. Rhodes; I am not

qualified to state what the others are. My salary is $2,400 a year, and Mr. Rhodes' is $1,800 a year.

Q. Are those reasonable salaries to be paid for the services rendered to the company?

A. I consider them so.

Q. I wish you would state whether or not a salary of $2,500 would be reasonable to be paid as a salary to the president of the company, in your opinion.

A. I would consider it a very reasonable salary.

Q. What have you to say of $1,500 to be paid to the secretary and treasurer of the company?

A. I would also consider that a very modest salary.

Q. And $800 for the bookkeeper? I mean these annual salaries, $2,500 for the president, $1,500 for the secretary and treasurer, and $800 for the bookkeeper.

302 A. Yes, sir.

Q. What have you to say as to $800 for the bookkeeper?

A. I consider that very low.

Q. And these are the only salaried officers?

A. As far as I know; yes, sir.

Q. Well, you are pretty well acquainted with the salaries of the officers of the company? You are an officer and a director?

A. Yes, sir.

Q. If there were any other salaried officers you would be likely to know it, wouldn't you?

A. I think so.

Q. It is your information that the capital stock you have referred to has all been paid up?

A. Yes, sir.

Judge Sanders: I believe that is all I want to ask Mr. McCarthy.

Recross-examination.

Judge Ritz:

Q. Mr. McCarthy, you said you thought $2,500 was a reasonable salary for the president of the company. What services does he rendered the company?

A. Well, it would be a pretty hard matter to operate a company properly, a company like this that has had the financial difficulties to undergo, and the many perplexing problems that we have had to shoulder, to go on without a president. I think he has got a great many duties to perform.

Q. He lives in Philadelphia, doesn't he?

A. He lives in Philadelphia; yes, sir.

303 Q. And is engaged in other business, isn't he?

A. Not to my knowledge.

Q. He is engaged largely in the real estate business in Bluefield, isn't he?

A. Well, Mr. Wirgman holds property here in trust for the stock-

holders of the Bluefield Water Works and Improvement company, but to my knowledge doesn't share in the profits of this real estate.

Q. You say the Bluefield Water Works and Improvement company own property here to which Mr. Wirgman owns the title as trustee?

A. Yes, sir, I suppose that is true. I am not particularly acquainted with the inside workings of that part of it, but I presume that is true.

Q. And you haven't taken into consideration in computing a return on the capital — that property at all, have you?

A. No, sir; no, sir. It is not connected in any way with the property of the Bluefield Water Works and Improvement company, so far as my part of the Bluefield Water Works and Improvement company is concerned. It only—As I understand, any proceeds from the sale of real estate here goes to the stockholders of the Bluefield Water Works and Improvement company direct, perhaps.

Q. At one time in its history the company did own all the real estate, or practically all the real estate, here in the city, didn't it?

A. They owned that part that the city is built on from Bowman street on the east to Mercer street on the west, and again on
304 the south side—that is, from the top of the Gravely ridge, this hill right here in Bluefield, to the top of the hill on the other side, or north side of the railroad. They also owned what was known as the Davidson tract, a piece of land lying between Chestnut street and Lynn street on the south side of Bluefield avenue to the top of the Gravely ridge.

Q. And they operated the real estate business and the water company altogether for quite a while, didn't they?

A. They did; yes.

Q. And then at a certain time they pulled the real estate out and left the water company running on and put the real estate in the name of an individual to be held as trustee for the benefit of the stockholders?

A. In order to divorce entirely the two accounts, as I understand, this change that you speak of was made.

Q. How much of the liabilities of the company did they pull out with the real estate?

A. Well, I don't know about that. I have no idea; I don't know whether they had any liabilities when this change was made.

Q. They had a capital stock liability, didn't they?

A. Yes, yes. It may have been; I don't know about that. I don't know whether they took out any or not; I am not sure about that. I don't think they did.

Q. They just left the water company to bear all of the capital stock liability for the real estate and everything, and took
305 the real estate out in the nature of a dividend to the stockholders?

A. Well, I don't know about that. I am sure.

Q. Now, Mr. Wirgman comes to Bluefield only occasionally, doesn't he?

A. He comes here about once a year, maybe twice a year sometimes.

Q. And that is all the connection he has with the active operation of the plant on the ground?

A. Well, it is the only direct personal contact with the operation right on the ground, but he is in personal touch and direction with the work on the ground from his Philadelphia office almost daily.

Q. Well, you direct the work too on the ground, don't you?

A. Yes, I do, but I get my directions from him.

Q. He directs you and you direct the work?

A. Yes.

Q. You are a practical engineer, and know about that sort of work, don't you?

A. Yes——

Q. And he is not?

A. (Continuing:) I conclude so.

Q. And he is not, is he?

A. Well, Mr. Wirgman is pretty well acquainted with the operation and maintenance of water works, well qualified to direct it.

Q. But it is two of you doing the same thing, one of you directing the other one, and then the other one directing the work?

A. No, I don't think that way, Judge.

306 Q. Now, the bookkeeper you spoke of, he lives in Philadelphia too, doesn't he?

A. Yes, he lives in Philadelphia.

Q. And all the books he keeps is books that he makes up from transcripts of book- that you have here?

A. No, we don't make any books. We don't keep any books here. Our reports go in either daily or weekly or monthly, as the case may be—yearly—to Mr. Wirgman; and, in fact, every transaction the company makes is transferred and sent to Philadelphia, and the accounts are kept there strictly. We don't keep any accounts here at all.

Q. You have accounts with all your customers here, don't you?

A. No, we do not.

Q. The bills are made to your customers from here?

A. No. You mean our water registers?

Q. Yes. That is the only customers you have, isn't it?

A. Well, I had in mind the people we bought material from, but I understand you mean parties we sell the water to. We don't keep any books in regard to that, except the usual customer register and cash book entries that are usually kept by all water companies. We don't keep any ledger or journal of anything of that sort.

Q. Well, it is not necessary, in order to run a water company, to have a journal or ledger?

A. It don't seem to be with us.

307 Q. In fact, the only books you have with your customers are kept here?

A. Yes, sir; that is, as far as the water is concerned.

Q. And the books that are kept in Pennsylvania are made up from reports that you make weekly and monthly and annually?

A. Yes, and daily.

Q. Yes, some are made daily and some monthly and some annually?

A. Yes, and some weekly.

Q. Why couldn't those books be kept here?

A. I suppose they could. They are kept in Philadelphia just as an expedient.

Q. The secretary and treasurer gets $1,500. What does he do?

A. He looks after the business of a secretary and treasurer in Philadelphia.

Q. He doesn't come down here at all, does he?

A. Oh, yes, he comes here often.

Q. When one of these gentlemen comes down here the company pays his expenses?

A. I don't know anything about that. I know our traveling expense account is very light, some years nothing.

Q. Does the secretary and treasurer do anything?

A. Oh, yes, I hear from him every day.

Q. Does he direct you how to run the plant?

A. Oh, yes, sir; he writes me every day. A great part of the correspondence is from him.

Q. He doesn't even have charge of the funds, does he? Don't you disburse the funds on checks signed by yourself?

308 A. No, sir; he does that. I just handle the payrolls.

Q. What other expenses do you have?

A. Well, some months we have $2,500 of material.

Q. You say yourself, Mr. Wirgman, and Mr. Triol are directors of the company, but none of you are stockholders except that you own one share of the stock?

A. Yes, sir.

Q. Who are the real beneficial owners of the stock?

A. I don't know that I can tell you. There are two stockholders in the company, but I don't know just now what their names are.

Q. How many directors are there in the company?

A. I believe there is five.

Q. And who is the other one besides the four you have named?

A. I believe Mr. Campbell. W. B. Campbell must be the one. I believe I named four.

Q. What salary does he get?

A. I don't know, I am sure.

Q. Do the stockholders of this company live in this country or abroad?

A. They are in this country.

Q. But you don't know who they are?

A. No. I suppose they are in this country. I suppose this—they are United States people.

Judge Ritz: Well, I believe that is all.

Redirect examination.

Judge Sanders:

Q. Well, whether the bookkeeper is in Philadelphia or
309 Bluefield, it is necessary to have one, isn't it?

A. Yes, sir; and it would cost much more to furnish a bookkeeper than the salary that is paid to Mr. Triol. In other words, we couldn't employ a bookkeeper for that money here.

Q. In addition to the services of your secretary, Mr. Rhodes, it is necessary to have a bookkeeper, I understand?

A. Yes, sir.

Q. And if you employed him here it would cost you more than you are paying Mr. Triol, $800 annually?

A. It certainly would, yes.

Q. I believe you stated yesterday, but I am not certain, when it was that you separated the business of the company—that is, your real estate business from the water plant.

A. I can't say just when that was separated, but I suppose it was about December 31, 1908.

Q. 1908?

A. Yes. I am only presuming that now; I just presume it on account of this statement being made up here.

Q. It was about that time, wasn't it?

A. It, I presume, dated from that time.

Q. Was any of the real estate of the company that was conveyed or held by Mr. Wirgman as trustee taken into consideration in the valuing of the company's property in connection with this water plant?

A. In this inventory?

310 Q. Yes.

A. Not in this inventory at all.

Q. Only the property used in connection with the water plant was taken into account in the inventory filed with Mr. Alvord's evidence?

A. Yes, sir, that is all that is in the inventory.

Commissioner Northcott:

Q. Mr. McCarthy, have you filed with this record any statement of the annual operating expense of the company?

A. I don't believe we have.

Judge Sanders: I am going to introduce the books and show that.

Commissioner Northcott:

Q. Do you know what the investment account of this company shows, the money actually put into the water business by the stockholders of the company?

A. It seems to me it is about three hundred—That is, the book accounts, you mean, as it stands on our books?

Q. The investment account.

A. The investment, I think, as it stands, less depreciation charged off, it occurs to me is about $330,000. That is only a guess, you know.

Q. And what is the capital stock outstanding?

A. $312,000.

Q. Is any part of that capital stock or the proceeds from it used in the real estate business, or do you know?

A. I can't say. I don't think there was, but I ain't posi-

311 tive about that.

Q. Well now, if there is only $312,000 capital stock outstanding, and the investment account shows upwards of $330,000, where does the difference come from?

A. Well, I don't know where the money was obtained; it may have been borrowed; it may have been, I suppose, taken out of the earnings of the company, you understand, and put into the plant. I presume that is where it came from.

Q. Have you any means of knowing, or can you state just what amount of money has been put into this water business by the owners, aside from earnings?

A. No, sir; no, sir, I don't know.

Q. Who can give that?

A. Mr. Wirgman perhaps can, or Mr. Triol.

Q. Mr. McCarthy, doesn't the company make an annual return for taxation purposes to the Board of Public Works?

A. Yes, sir; yes, sir.

Q. I understood you to say that you didn't know that any return had been made?

A. No, I didn't mean that; I didn't mean to convey that idea. I meant to say that we had nothing to do with the placing of the value on this plant, you understand. We make a return—a return is made every year, but what amount that is, now, I couldn't say; I don't know what it is returned at; I am not able to say.

312 Q. Have you never seen any return made by the company?

A. Yes, I have seen several of them, but I don't recall what the amounts were.

Q. Are you consulted or advised with in making up the returns?

A. Well, I make up a good deal of the data that goes on the returns in the way of pipe lines, extensions, and things of that kind; and the financial part is put on in the Philadelphia office.

Q. When were you last before the Board of Public Works?

A. In May last.

Q. At that time you told them that in your opinion, for taxation purposes, the value of this plant should not be raised about $190,000?

A. I didn't tell them that it shouldn't, but I pleaded with them not to raise it.

Q. You gave them as your opinion that that was a sufficient value for taxation purposes?

A. Yes, sir, figuring on the returns, you understand.

Q. Do you think there should be two values, Mr. McCarthy, one for taxation and one for rate making purposes?

A. Well, that comes back in the channel again. (Laughs.) I figure this way, if we were getting a proper return on our money, I would say it should not be.

Q. Do you think now there should be two values, one to be taken into consideration by the Board of Public Works in fixing
313 the value for taxation, and one to be taken into consider- by us in fixing the return on that value?

A. Yes, sir, I do believe in two values. We have it every day. Take two houses here in town, both exactly alike, one in a good neighborhood, where the rent is high; another in a poor neighborhood, where the rent is cheap. You have got the same capital, but the return is not the same. The assessors take that into account.

Q. You would take that into account if you went to buy the houses, wouldn't you?

A. Yes.

Q. That wouldn't be two values, then, would it?

A. I mean the building value. It cost just the same to build the houses; both are just exactly alike.

Q. What dividends does this company pay?

A. I have heard, but they are very small; I couldn't enumerate them.

Q. You don't know what it amounts to on the actual investment made?

A. No, sir, I don't know, but there has been a little—a small item a number of years ago.

Q. If you don't know the amount of the actual investment in this property, how can you state that the dividend is a small return?

A. Well, I have it on good authority that the investment as it stands on the books even is about $330,000; and I am satisfied that the plant cost a good deal more than that, because there has been a number of thousand dollars of depreciation, I know, off, even on $330,000.

314 Q. But you have just testified, haven't you, Mr. McCarthy, that you don't know where this $330,000 came from?

A. Well, I know this, the $312,000 has been paid in cash—at least, I am well informed; supposed to be truly informed about that; and I would say that the balance of the money has been taken out of earnings of the company; but I would say also that, in reply to your question, that even on $312,000, the amount of the capital stock, that the amount of dividends already paid by the company on that alone would be very small.

Q. But I understood you to say, in response to a question of mine, that you didn't know how much of this $312,000 went in the water business and how much in the real estate business?

A. Well, I believe it all went in the water business, as I understand it. You understand, it was outlined to me at the time; I can't recall just what it was, but I think the land account, you understand, was entirely divorced—taken out—the money value of the land taken out of the water plant.

Q. And taken out of the capital stock?

A. Well, I don't know anything about that, now; I couldn't say about that.

Q. Then you don't know how much of this capital stock was devoted to the water company and how much to the land company?

A. Well, I don't know. I just suppose that all of the $312,000 was devoted to the water company.

315 Q. But you don't know?

A. No, I don't know about that.

Q. Then you don't know whether the return has been great or small?

A. I know on the water plant they have been small.

Q. On the investment in the water plant?

A. Yes, sir.

Q. You know that has been small?

A. Yes, sir.

Q. Will you kindly explain how you know that, if you don't know what the investment is?

A. Well, I believe I explained that.

Q. That may be, Mr. McCarthy, but I didn't understand the explanation?

A. There is $312,000 in the water plant.

Q. Do you know that?

A. I understand that. Unless I am very much wrong, that is true. That is what I have always understood, you understand, just like I know what Judge Sanders' name is here, or who is president of the United States. It is a matter of common knowledge among the members of the water works family here, and it is barely possible, you understand, that I may be misinformed on that point, but I think that is not so.

Q. What do you think that plant is worth now, true and actual value, Mr. McCarthy?

A. Well, I, of course, wouldn't know very much about it, except from Mr. Alvord's reports. We have Mr. Alvord's reports there, and we hired him to make the valuation.

Q. And you have testified that in your opinion it was

316 an accurate and correct one?

A. Yes, sir.

Q. And what does it make the value of this plant?

A. About $540,000, I believe, in round numbers.

Q. Even considering that the investment is $330,000 in this water plant and the value is $540,000, that is a pretty fair return, isn't it, aside from any dividends on the business?

A. Well, I don't know. A person would have to know the amount of depreciation that has been written off.

Q. Well, isn't this $540,000 valuation set by Mr. Alvord after depreciation is written off?

A. Well, you don't understand me. I mean from our side, from the book account side.

Q. What has that to do with it?

A. Well, you are predicating this proposition on the book account value on the one side, as against the inventory of Mr. Alvord on the

other. Now, if you take into account the inventory figures and depreciation, you understand, on the one side, you should take into account the book account and depreciation on the other side.

Q. Well, the very best you can figure from your knowledge is that there has not been more than $330,000 in cash put into this company by the owners? Isn't that true?

A. That is as far as I know; yes, sir.

Q. Now, take that to be true, and if the value of the plant now is $540,000, isn't that a pretty fair return upon
317 an investment of $312,000 put in, aside from any dividends?

A. Well, I don't know whether that would be true or not, taking into account the depreciation written off the books.

Q. Well, if $312,000 is the amount put in, and it is worth now $540,000, that shows a profit of $228,000, doesn't it, aside from any dividends?

A. Well, I don't know. This plant has been in operation somewhere in the neighborhood of twenty-five or six years.

Q. Now, what is the depreciation written off of the book account got to do with the question I am asking you? If $312,000 is the investment, and it is now worth $540,000, if that is not a pretty fair return, aside from any dividends that may have been paid?

A. Well, if it was during a short period of time I would say it would be, but taking into account the amount of money that was put into this plant years ago, and the amount that has been added to it since, and figuring the interest, I don't know whether it would be or not.

Q. Do you think $312,000 was put into this plant twenty-five years ago?

A. Not at that time.

Q. What percentage of it?

A. I couldn't say.

Q. What percentage of it since you took charge of it?

A. Well, perhaps $100,000.

Q. Then, if $312,000 is invested, that would be $212,000 invested up to the time you came here, in round numbers?

A. Well, yes, sir.

318 Q. Have you any knowledge what the original investment was that started this plant?

A. No, sir.

Judge Sanders:

Q. Mr. McCarthy, you have been asked whether you believed that there should be two values, one for tax purposes and another for rate making purposes. I don't know that I understand what you said about that. I believe you said there should not be.

A. Well, ordinarily there should not be. I said in this case here——

Q. Do you mean to say in this case that there should be two values fixed, assuming that the taxation value has been fixed for this year $190,000, and the commission would fix a larger value for rate

making purposes, wouldn't it next year necessarily follow that the value should be fixed for taxation at the value fixed by the commission?

A. Well, I don't know.

Q. Well, necessarily it would be only a temporary difference in the values, wouldn't it, if the Board of Public Works has valued it at $190,000 for tax purposes, and the commission values it at $540,000 for rate making purposes, that could only be a temporary difference in the values?

A. Yes, it couldn't alter the actual values in the plant. Of course, we have nothing to do with the assessment. The Board of Public Works fixes that themselves; and what they would put it at would have no bearing on the actual value of the plant.

Q. But I mean to say, if the commission would fix a value
319 on this property and fix the rates accordingly, sufficient to bring a fair return on the property, why, then, couldn't the Board of Public Works, as a matter of fact, fix the value on it for tax making purposes to conform to the value fixed by the commission?

A. Well, I think so.

Q. And there need not necessarily be two values, if the commission fixed the value at such a sum as will render a fair return to the company?

A. I think not.

Judge Sanders: That is all.

(Witness stands aside.)

WILLIAM MCCARTHY, recalled, testified as follows:

Direct examination.

Judge Sanders:

Q. You have been asked, Mr. McCarthy, as to what money was actually invested in this water company. I will ask you to state, if you know, as a matter of fact, or from your information and associations with the officers of the company and your business relations with the company, as to whether or not this company sold considerable of its real estate and invested that in the development of its water plant.

A. They have sold a great deal of real estate, and I understand that large sums were used in the development of the water plant.

Q. At the time that this company bought this real estate
320 here, was the land high or low?

A. Why, the land was very low.

Q. When was that land bought by the company? Do you remember?

A. I think it dates back to about 1890—1889 or '90 somewhere.

Q. Do you know what earnings of the company have been put into the plant of the company?

A. No, sir, I do not.

Q. Do you know what the appreciation of the property of the company has been?
A. No, sir.
Q. Nor the depreciation?
A. No, sir.
Q. Do you know what the deficits have been in the past?
A. No, sir, I do not.
Q. Then, Mr. McCarthy, do you know, or have you any means of knowing, how much money has been actually invested in the water company plant and property?
A. No, I couldn't say; I don't know.
Q. But you have only undertaken, as I understand it, to give the value of the water company's plant as inventoried by Mr. Luce, and has valued by Mr. Alvord?
A. Yes, sir.
Q. As of the first day of January, 1915, and up to this time?
A. Yes, sir. Well, I don't believe that would be right; I don't believe there has been any values added to this inventory, that I recall, since the date of the inventory.

321 Q. Well, that conforms to my question. I believe I asked you yesterday if the valuation now was practically the same as it was when the invoice was made in 1915.

A. Well, I would say practically so, with the exceptions of what little may have been added to the plant since that time.
Q. You have made that explanation, I believe, heretofore in your evidence?
A. Yes, sir.

Judge Sanders: That is all.
Judge Ritz: That is all.

(Witness stands aside.)

A. L. RHOADS, a witness introduced on behalf of the applicant, having been first duly sworn by the commissioner, testified as follows:

Direct examination.

Judge Sanders:

Q. Mr. Rhoads, what connection have you with the Bluefield Water Works and Improvement company, the applicant, if any?
A. Well, I am the cashier there and perform general office duties.
Q. What are your duties as cashier?
A. Well, the supervision of collections and getting out the bills—contracts.
Q. Do your duties require you to keep in touch with all the collections of the water company?
A. Yes, sir.

322 Q. I wish you would state what their losses have been per annum during the last six years on account of failure to collect water rents.

A. I don't think they have been over $10 per year.

Judge Sanders: That is all.

Judge Ritz: That is all, Mr. Rhoads. I may want to ask him about another matter later on.

(Witness stands aside.)

WILLIAM H. TRIOL, a witness introduced on behalf of the applicant, having been first duly sworn by the commissioner, testified as follows:

Direct examination.

Judge Sanders:

Q. You live in Philadelphia, I believe, Mr. Triol?

A. I do.

Q. Are you connected with the applicant, Bluefield Water Works and Improvement Company?

A. I am, as accountant.

Q. How long have you held this position with the company?

A. I have been connected with the Bluefield company since Mr. Bryan's death in 1901.

Q. You are a director of the company too, I believe?

A. Yes, and qualified stockholder.

Q. What are your duties as bookkeeper?

A. To take care of all the accounting.

Q. I wish you would please state what have been the gross receipts of the applicant water company for the years 1909 to 1916,
323 inclusive, arising from its water plant alone.

A. You want that in detail?

Q. Excluding entirely any real estate business that may have been done. Yes, sir.

A. $26,167.07 for 1909; $31,951.86 for 1910; $35,890.24 for 1911; $33,983.50 for 1912; $36,166.72 for 1913; $39,908.98 for 1914; $43,483.31 for 1915; seven years, a total of $247,551.68 for the seven years.

Q. Now, I wish you would please tell me what has been the operating cost per annum for the years of 1909 to 1915, inclusive, of the plant of the applicant, Bluefield Water Works company, in furnishing water to the city of Bluefield.

A. Well, in what way shall I give you that? In detail?

Q. Yes, give it to us in detail. Make it as full and plain as you can.

A. The maintenance and repair account for 1909, by the way of material used, $560.52; 1910, $2,574.54; 1911, $800.38; 1912, $929.44; 1913, $1,051.89; 1914, $1,885.56; 1915, $2,052.43. The maintenance and repair account, $1,486.69; 1910, $3,857.55; 1911, $3,228.94; 1912, $5,529.92; 1913; $2,717.87; 1914, $4,007.92; 1915, $3,304.63.

For coal, freight, and hauling, 1909, $266.75; 1910, $967.53;

1911, $2,498.61; 1912, $1,043.52; 1913, $1,076.49; 1914, $2,393.07; 1915, $2,314.78.

For the engineer and fireman, 1909, $911.29; 1910, $1,722.59; 1911, $2,213.62; 1912, $1,602.04; 1913, $1,907.53; 1914,
324 $2,404.41; 1915, $2,257.45.

Inspection, 1909, $720; 1910, $825; 1911, $900; 1912, the same; '13, the same; '14, the same, and '15, the same, $900 each.

Salaries paid at Bluefield from 1909, $3,922.06; '10, $3,890.83; '11, $3,720; '12, $3,900; '13, $3,900; '14, $4,800; '15, $4,800.

You- question was the absolute operating expenses. Might I ask right here, am I entitled to charge in insurance and compensation fund?

Q. Well, you can put that in.

A. That is on payroll items, 1909, $75.93; 1910, $156.43; 1911, $76.66; 1912, $112.85; '13, $217.14; '14, $308.22; 1915, $311.04.

Stable expenses in 1909, $140.40; '10, $126.94; '11, $154.89; '12, $129.78; '13, $118.83; '14, $86.03; '15 has no stable expense.

*Pul*mbers, bonds, and laboratory expense are combined accounts; I can't separate them. In 1910—I haven't any 1909—$72.34; '11, $40; '1*3*, $40; '13, $40; '14, $40; '15, $44.73.

Now, I have also accounts which are general in their nature, but which go into the general profit and loss account. Those that I have just given you are the absolute operating expenses, as I have conceived them. We have taxes in 1909, $2,369.03; 1910,
325 $1,994.15; 1911, $8,533; 1912, $2,069.18; 1913, $2,202.53; 1914, $2,448.57; 1915, $3,439.78.

Traveling expense in 1909, $179.39; 1910, $195.77; 1911, $58.50; 1912, nothing; 1913, $172.05; '14, $22.30; '15, nothing.

Legal expense, 1909, $1,494.04; '10, $1,633.81; '11, $1,823.76; '12, $606.90; '13 $210; '14, $200; '15, $250. I want to say in this connection, Mr. Commissioner, we have still on the books an open account unsettled, and every charge item that has not been apportioned as yet, therefore, does not appear. The expenses last year at Charleston and expenses this year, we are keeping that as an open account.

Q. That is in the cas*t* of the City of Bluefield against Bluefield Water Works and Improvement company, pending before the Public Service Commission,, and consolidated with this case?

A. Yes, sir, but yet kept as an open account in the books.

Judge Ritz:

Q. It hasn't been paid yet, has it?

A. Well, in so far as it has been charged up it has been paid; some of it hasn't yet been charged up.

Salary account in Philadelphia, 1909, $1,200; 1910, $1,350; 1911, $1,350; 1912, $1,350; 1913, $3,508.31; 1914, $4,800; 1915, $4,800.

Office expense, 1909, $1,166.73——

Commissioner Northcott:

Q. Just state where this is.

326 A. Well, it is office expense.

Q. Philadelphia and Bluefield, either or both?

A. Well, this is a combined account, I will say from my memory, is a combined account of all office expense, Bluefield and Philadelphia. 1910, $1,076.39; 1911, $943.45; '12, $993.91; 1913, $1,256.76; '14, $1,049.79; '15, $1,322.14.

Interest account. 1909, $984.76; '10, $795.06; 1911, $1,015.78; '12, $1,047.78; '13, $3,036.05; '14, blank; '15, blank.

Adjustments, exonerations, and losses, principally adjustments and exonerations. 1909, $1,685.91; 1910, $513.38; 1911, $248.25; 1912, $271.98; '13, $132.31; '14, $307.51; '15, $613.35. Depreciation account. This includes plant and inventories. 1909, $6,859.99; 1910, $6,281.03; 1911, $6,243; 1912, $4,432.39; 1913, $8,141.42; 1914, $4,557.87; '15, $4,655.10. I think that includes all of the expense accounts.

Judge Sanders:

Q. Now, I will get you to state what the net returns or profits of the applicant water company were derived from the operation of its water plant and the collection of water rates for the year 1909.

A. For 1909 I will figure the surplus of revenue, $2,865.80.

Q. How is that?

A. $2,865.80.

Q. That is the net profits, is it?

A. That is the surplus, net.

327 Q. All right. Go ahead.

A. That is the net of the profit and loss account for that year. That is the better way of putting it.

Q. You mean net income?

A. Yes.

Q. Well, what was it for 1910?

A. $3,773.52.

Q. 1911?

A. $9,410.07.

Q. 1912?

A. $8,859.31.

Q. 1913?

A. $5,026.70; 1914, $9,210.64; '15, $12,840.03.

Q. Have you figured out what the net income to the company would be on its capital invested—what percentage?

A. Well, there is always a calculation to be made from that that figures the amount per cent. I have figured here a total of those figures, which I have given you, $51,986.07, a total for seven years.

Q. For the seven years that you have referred to, 1909 to 1915, inclusive?

A. 1909 to '15.

Q. And that is the net profits, or net income to the company for this seven years?

A. That is what I make it, sir.

Q. And, of course, the per cent of earnings on the investment would depend on what you figured the investment at?

A. What you figure the investment, up to a certain point, the capital at one amount, and beyond that at another amount.

Judge Sanders: That is all, I believe.

328 Cross-examination.

Judge Ritz:

Q. Mr. Triol, how long do you say you have been the accountant of this company?

A. From about 1901.

Q. What was its capital stock paid in at that time?

A. $252,000.

Q. And at that time it was a large real estate owner, too, wasn't it?

A. There was a land account at that time.

Q. Since that time you have sold $60,000 of stock? Is that it?

A. We didn't sell it. We paid $60,000 for money that had been advanced—loaned—and the only way of paying it was to pay it with stock.

Q. You wished the stock on the people, then, for money that you borrowed from them, if you prefer to have it that way?

A. Yes, sir. That would increase the capital to $312,000; it was $252,000 and increased by $60,000.

Q. How long had it been $252,000 prior to that time?

A. The $60,000 capital was issued in 1913, I think in December, 1913. I would have to refer for that date, but I think it was December, 1913.

Q. How long had the company had that money, $60,000, borrowed?

A. I couldn't say.

Q. Was it borrowed in 1901?

A. Oh, no, I don't think it was.

Q. You borrowed that $60,000 some time betwen 1901 329 and 1913?

A. Yes, sir.

Q. Do you know what it was borrowed for?

A. For whatever necessary purpose the cash was required, but just exactly what, at the moment, I couldn't say. As far as my memory goes, the whole $60,000 was advanced subsequent to—(Refers to paper.) I think subsequent to 1912. That is the time the large interest account figures up.

Q. The company, then, had that a very short time?

A. Yes, a very short time, comparatively speaking.

Q. Prior to 1912 the capital stock of the company then was $252,000?

A. Yes, as I remember.

Q. And the company owed no money prior to the borrowing of this $60,000?
A. Not that I know of.
Q. The books will show that it didn't?
A. The books show it, of course. I am answering now from my memory.
Q. Aren't the books here?
A. Yes.
Q. I wish you would get them and testify from what they show instead of your memory.

(Witness gets books.)

Q. Now, you have the books of the company from its organization down to the present time, have you?
A. I have them all.
Q. When was the company organized, Mr Triol?
A. If my memory serves me correctly, 1890.
330 Q. Well, now, get the book and see what that shows.

(Witness refers to books.)

A. What was the question?
Q. When was the company organized?
A. I have an entry here as of December 31, 1890.
Q. Well, does that indicate that that was when it was organized?
A. That may be only the summing up entry.

Commissioner Northcott:

Q. Haven't you got the minute book here?
A. No, I haven't.
Q. That is in Philadelphia?
A. That is in Philadelphia. It can be procured immediately.
Q. I just wondered if you had it here, was all.
A. No, we haven't it here.

Judge Ritz:

Q. Well, that approximates the date of its organization?
A. Now, one minute, Judge. My first journal entry shown in this book is on April 3, 1890.
Q. On April 3, 1890, then, the company began business, or was organized?
A. Practically that is it. That is the date. I will see if there is anything further. That is practically the organization date, so far as actual transactions.
Q. What was the authorized capital stock of the company at that time?
A. December 31, 1890, $252,000.
Q. That was the authorized capital?
A. I won't say authorized. That was the capital.
331 Q. That was the capital paid in?
A. That was the capital paid in.

Q. Or charged upon the books?
A. Yes.
Q. How much money was paid for that $252,000 of stock?
A. $252,000 represents fully paid stock.
Q. I understand that represents fully paid stock, but was there $252,000 paid for it?
A. $252,000 paid for it.
Q. It was sold at par?
A. At par.
Q. And that money was all paid in before December 31, 1890?
A. That is the date of the entry, the last date, December 31.
Q. It was all paid in, then, prior to that time?
A. Yes, paid in prior to that time.
Q. Now, what did you do with it, the $252,000?
A. Well now, you mean as to what was purchased with the $252,000?
Q. Yes, that is what I want to know.
A. Water works at Bluefield, $17,882.10, bought from the Virginia company. $42,287.90, cash received from treasurer Virginia Land company to complete the subscription to stock.
Q. I want to know now what you did with the money, not who you got it from.

Judge Sanders:

Q. How was the $252,000 paid out arising from the sale of the stock?
332 A. I would have to audit the accounts right here to find that out; that is something I am not conversant with.

Judge Ritz:

Q. Haven't you got a trial balance or an account in your books that shows what the condition of your business was at the end of 1891?
A. There are most undoubtedly trial balances in existence, but I don't have them in my possession.
Q. And none of these books that you possess throw any light on what became of that $252,000?
A. The ledger naturally would show that.
Q. What light does it give?
A. I would have to look through the books and make a trial balance.
Q. You found an item of $17,000 paid for water works?
A. Yes, sir.
Q. Was that all that was paid out for water works?
A. That is all in this entry.
Q. How much of it was paid out for land during that year?
A. $82,330.
Q. Was there any of it paid out for any other purpose during the year 1891, that you can find?
A. There was 15 houses, $28,500.

Q. Those were houses that were constructed on land here in the city of Bluefield for sale, weren't they?

A. They were constructed by the Virginia company, and bought from them.

Q. They were not in connection with the water business
333 at all?

A. No.

Q. That is $17,000 and $28,000 and $82,000, $127,000. Is there not anything to indicate what became of the other $125,000?

A. $54,119, made up of $52,000 of land, $6,000 for houses—for houses built.

Q. That was more real estate that was bought here in the city of Bluefield?

A. That was more.

Q. It had no connection with the water company?

A. No, that is not a water works charge.

Q. And the $6,000 was for houses constructed on that real estate for sale?

A. That was for houses bought from the Virginia Investment Association that had been constructed by them.

Q. Had no connection with the water company?

A. It had connection with the company as a whole.

Q. Had nothing to do with the furnishing of water, is what I mean.

(No answer.)

Q. That $58,000 would still leave $67,000 of it. What became of that?

A. I can only tell you how the money was derived from the entries that were made.

Q. Let me ask you this, Mr. Triol. Did your books show that there was any money in the treasury on the first day of January, 1891?

A. I can answer that by referring to the cash book. That was what date?

Q. The first day of January, 1891.

A. First day of January, '91, $62,732.41.

334 Q. You had that much money on hand?

A. At that date that is the balance of cash as shown by the cash book.

Q. Yes. You have given us the items of expenditure during the time before that. Now, can you tell from your books what that money was spent for?

A. The books, of course, will show what the money was spent for.

Q. Well now, see if you can find out what became of that $62,000?

A. I will have to go through a whole year, Judge, to show all the separate items.

Q. All right. I want to find out what became of this money.

A. $3,279.91, office expense, land at Bluefield, made up a certain amount of money, probably eighteen or twenty different items. $15,000 was received in 1890, October 1st, from J. H. Dingey, treas-

urer of the Virginia Land company, on account of subscription to stock.

Q. I want to know what that money was spent for.

A. The only answer I could give to that is to prepare yearly trial balance sheets showing what was done from year to year. I haven't the trial balance sheets with me, and I couldn't tell from memory. The only way that question could be got at would be by trial balance sheets from year to year.

Q. You have accounted for all of it but $68,000.

A. I accounted to you for 171. I accounted to you for $54,000; I have just given you 15; I have two other items here, $3,998.08 and $8,000.

335 Q. That is the money received. I am trying to find out where it went to.

A. I couldn't do that without having trial balances for every year.

Q. You said you paid $17,000 for the water works. That is correct, isn't it?

A. Yes.

Q. You said you paid $54,000 for land at a certain time. That is correct, isn't it?

A. Yes.

Q. There were two items for houses and two items for land.

A. The other item—the remaining item which made up that $171,000 which I gave you first, which I endeavored to complete, but you asked another question, was a subscription amounting to $42,287.90, and that came from the Virginia Land company treasurer, as a subscription to stock. That was the balance of the 171.

Q. We are working at cross purposes, Mr. Triol. You are giving me the subscriptions to the stock, when I am trying to get what you did with the stock. In order to get at the whole thing, who were the subscribers to the stock of this company, and how much did they subscribe?

A. The Virginia land and Virginia Investment Association were the entire holders of the stock.

Q. How much did each subscribe for?

A. I can't tell you how much they subscribed for; I can tell you how much the ownership is now.

Q. Don't your books show how much they subscribed for in the beginning?

336 A. This item shows that the Virginia Land company—practically the two syndicate companies, the Virginia Land and Virginia Investment Association, were the subscribers for the entire stock. They are separate and distinct companies.

Q. Same stockholders?

A. Well, I won't even say that. There was a large number of stockholders in one company that don't appear at all in the other, so far as I know.

Q. These two companies subscribed to all the capital stock of the Bluefield Water Works and Improvement company. That was $252,000. How did these two companies pay that subscription?

A. Well, the very nature of the entry that I have just recited will show how the water works and the land and houses were acquired.

Q. At that time this Virginia Investment company owned a lot of land in Bluefield and houses in Bluefield?

A. No, I think they were bought entirely from the Virginia company.

Q. And also owned the water works plant in Bluefield?

A. That was owned by the Virginia company.

Q. And those houses and land and that water plant were turned in as a credit on the subscription to the capital stock? Isn't that true?

A. That is true, to the best of my knowledge.

Q. And the water plant was turned in at a fixed valuation of $17,000?

A. That was practically eighteen, Judge.

Q. $18,000 of stock of the Bluefield Water Works and Im-
337 provement company was issued in lieu of the water plant that was received?

A. Yes.

Q. The other $252,000 was paid for by transfer of the title to the land that was held by the Virginia company?

A. No, there was lots of cash. This $42,000, I stated——

Q. Well, I will ask you this way. How much of the balance of the subscription was paid for in land and houses?

A. None of the balance other than what I have recited. All the rest of it was paid in cash.

Q. Well now, you paid $18,000 of it for a water works?

A. Yes.

Q. That would leave $234,000. How was that $234,000 paid and when was it paid?

A. Well, I could only answer that by the dates and the information conveyed by these entries that I have just recited.

Q. All right.

A. The $171,000 which I gave you.

Q. Well, what about that $171,000?

A. It is the land, eighty-two; houses, twenty-eight; water works at eighteen, and forty-two thousand dollars cash from the Virginia Land company.

Q. Now then, $171,000 was paid by $18,000 for the water works and the balance for houses and lands. Is that correct?

A. That is it.

Q. $153,000 then for houses and lands. Well, that leaves $82,-
000. How was that paid? How was the $82,000 paid?

A. $54,000 of that was the Davidson tract.

338 Q. Davidson lands?

A. Davidson land, $48,001.92, and four houses, $6,000.

Q. Well, $54,000, all told, was the houses and land?

A. Yes.

Q. That left $28,000. How was that paid?

A. That was paid in cash.

Q. Now, there was only, then, of the subscription of $252,000, there was only $82,000 paid in cash?

A. That was cash.

Q. $28,000 of cash paid in?

A. Yes.

Q. Can you tell me what became of this $28,000 cash?

A. I can only answer that as I did before. I would have to take the balance sheet of the company.

Q. Of the original capital, there was only $28,000 paid in cash, and you can't say what became of that $28,000?

A. No, except in a general way.

Q. What did the water plant consist of that was acquired by the Bluefield Water Works and Improvement company at that time?

A. I don't know. From memory I don't know; I am not at all conversant with that time.

Q. There was no further capital put in this company until about 1912 they borrowed $60,000?

A. There was $60,000 borrowed about that time.

Q. And about 1913 or '14 they issued stock for that?

(No answer.)

Q. So that the only money that has been put in was $88,000?

339 Judge Sanders:

Q. You mean out of the capital stock?

Judge Ritz: Yes.

A. That was the amount of money represented in the cash, if that is what you mean.

Q. The present capital stock of $312,000 was made up of a water plant valued at $18,000, real estate valued at $207,000, $28,000 in cash at the time of organization, and $60,000 in cash subsequently put in, about 1913?

A. Yes, that in addition to anything else that may have been put in; that represents the capital.

Q. What other capital has been put in?

A. Well, there is no capital, if you take it as capital stock, but there is a largely increased amount that has not been capitalized, represented by material in the inventory.

Q. For how many years did the Bluefield Water Works and Improvement company carry on its business as a real estate company and a water company combined?

(No answer.)

Q. I wish you would, Mr. Triol, find out, between now and to-morrow morning, what became of that $28,000 of money that was put into this concern, and also what became of the $60,000 in money that was put in in 1913.

(No answer.)

NOTE.—At this point, it being 5 o'clock p. m., an adjournment was taken until the following day, Thursday, July 27, 1916,
340 9:30 o'clock a. m., at which time this hearing was resumed as follows:

(Witness stands aside.)

The applicant here rested its case for the time being).

Thereupon, the respondent, the City of Bluefield, to maintain the issue on its behalf, introduced the following evidence, to wit:

WALTER E. MILLER, introduced as a witness on behalf of the respondent, having been first duly sworn by the commissioner, testified as follows:

Direct examination.

Judge Ritz:

Q. Miller, where do you live?
A. Madison, Wisconsin.
Q. What is your profession?
A. Civil engineering.
Q. What particular branch of the engineering profession?
A. Well, during the last nine years it has been chiefly valuation of public utility property, principally water and gas utilities.

Q. What, if any, commission have you been engaged with
341 during that time?

A. I have been with the Railroad Commission of Wisconsin since January, 1907, in its engineering department.
Q. Does the Railroad Commission of Wisconsin have jurisdiction of fixing rates and valuations of all sorts of public utilities, as well as railroads?
A. It has.
Q. During that time, Mr. Miller, what actual work have you done in the way of valuing property such as the property of the Bluefield Water Works and Improvement company?
A. For the Commission alone?
Q. Or otherwise.
A. Well, I have made a large part of the valuations of the water plants that have been valued by the Commission's staff, participated in all of those, and in most of the valuations of gas plants; and I have served in other cases in other states, independently of the work of the Commission. I assisted in the valuation of property of the Pennsylvania Water company, supplying the suburbs east of Pittsburgh, a property of about $3,000,000 valuation. I assisted in the valuation of the People's Gas, Light and Coal company, in Chicago, with Mr. Haginaw, in 1910 and '11, in making his report to the council committee on gas, oil, and electric light; and there was one or two other cases, I don't just recall now, outside of the work of the Commission; but the valuation work that I personally have done in the last nine years would amount to quite a number of millions of dollars.

342 Q. Are you acquainted with the properties of the Bluefield Water Works and Improvement company?

A. I am.

Q. How did you happen to become acquainted with these properties?

A. I beg your pardon?

Q. How did you happen to become acquainted with these properties?

A. Through having been employed by the City of Bluefield to make a valuation of that property, and through my examination of the inventory prepared by Mr. Alvord, and through personal examination of substantially all visible parts of the property.

Q. An inventory has been introduced with the testimony of Mr. Alvord, which he says is a correct inventory of the properties of the Bluefield Water Works and Improvement company. Have you had access to that inventory heretofore?

A. Yes, sir.

Q. Have you checked that with the properties of the company on the ground from a personal examination of them?

A. Yes, sir.

Q. Did you make a valuation of the properties of the Bluefield Water Works and Improvement company?

A. I did.

Q. What information and data and inspection did you have or did you make for the purpose of this valuation?

343 A. Well, I had the inventory—copy of inventory made by Mr. Alvord, and I had—I was given access to all of the records of the company, of cost of the various items of comparatively recent construction that I was interested in seeing, so far as the company had the information desired. It is my understanding that the company wasn't able to show the separate costs of pipe extensions, those costs having been lumped in with other costs in such a way that they couldn't be segregated, and as to that and several other items it seemed impracticable to get the segregated costs of some of the items that I would like to have had, and was left to value those items on the basis of the application of my own judgment to the conditions as I saw them.

Q. Mr. Miller, did you find the inventory which has been introduced in evidence to be a correct inventory of the properties of the company?

A. Substantially correct as to the—Well, correct as to the main items, and substantially correct throughout. I found a number of differences in calculated quantities of work and materials, and those have been noted here, in the main. I think possibly there were a few others which didn't get into the list that I made.

Judge Sanders:

Q. Well, those are the ones that are noted in the stipulation?

A. Yes.

Q. You might say where they were noted.

Judge Ritz:

Q. I call your attention to a stipulation which has been
344 entered excepting from the agreement as to the correctness of this inventory certain items. I will ask you to state if these are the discrepancies that you discovered between the inventory and the actual property as you found it?

A. Well, these are substantially all of them, but I have subsequently found that I did omit a very few other discrepancies between my calculations of quantities of work and materials and those which had been calculated and entered in the inventory. For example, it appeared that the amount of excavation for foundations of the Ada pumping station had been figured from the present surface of the ground, which had been filled, according to the inventory, about four feet above the level of the ground around the old Ada pumping station, which was displaced by the present one.

Q. Now, taking up the items referred to in this stipulation, I wish you would indicate what differences there are between your estimate or your calculation of the quantities and the estimate or calculation contained in the inventory heretofore filed, and also state whether or not the quantities given by you are correct, and why you believe them to be correct in each case.

A. The first item is the number of cubic yards of concrete in the spring house of the Ada spring. The inventory, on page 49, states the quantity as 46 cubic yards. The inventory on page 127, exhibit No. 22, shows a plan and sectional elevation of that
345 spring house, which, so far as I can ascertain, is a correct plan and sectional elevation, and my calculation of the quantity of concrete in that structure shows 32 cubic yards based on this plan and sectional elevation.

Q. You made that calculation from the plan and sectional elevation, after checking that with the spring house from a personal examination, did you?

A. Yes, sir. Now, some of the dimensions are not given on these drawings except by scale; and my calculations were necessarily based in part upon the scaled dimensions of the various portions. The next item is number of square yards of shingles on spring house——

Q. Well, I believe Mr. McCarthy, upon investigation, stated that that was a mistake; that you were correct about that?

A. Yes, sir. The true quantity is greater than is given in the inventory, apparently.

I differ with the figure given in the inventory, on page 50, for the length of 18-inch tile pipe from the spring house, because of my reliance upon the plan and sectional elevation given in the inventory, which shows 6 feet less length than that stated in the inventory on page 50. The item is a comparatively small one, and not worthy of spending much time on.

On page 61, cubic yards of earth excavation in Ada pump-
346 ing station, building foundation. The quantity there given is 264 cubic yards. My calculation was based upon the plans which have been reproduced by a photographic process and shown

in the inventory, pages 135 to 138, inclusive. My calculation was based upon the plans and the statement contained in the inventory, that the grade of the old pumping station yard had been raised about 4 feet. I figure the excavation from the grade of the old pumping station yard, and naturally got a smaller quantity than if the calculation was based upon the present grade. I have 205 cubic yards of excavation.

Q. Then if you had figured that from the grade as I understand it was, 4 feet below the present grade, you would have gotten it still less?

A. I did figure it on the old grade, 4 feet below the present grade. The filling of that yard is entered in a separate item.

Q. Well, if you had figured from the present grade, you would have gotten less?

A. Gotten more.

Q. Gotten more?

A. More than I did, and probably the same as is given in the inventory.

Q. You think if you had figured from the present grade instead of from the grade as you were informed it was that you would have gotten the same as the item in the inventory?

A. I think so, substantially.

Again, on page 61 of the inventory, I differ with the statement there given as to the cubic yards of concrete in foundations
347 for building. There is 264 cubic yards entered in the inventory, page 61. My calculation, based upon the plants and the sectional drawing on page 136, results in 200 cubic yards as the quantity of concrete in foundation walls, in place of 264.

Page 62, the lumber in roof and ventilator. I believe Mr. McCarthy admitted that there was an error in the items of lumber as computed and entered in the inventory.

Q. I believe it was stated that that had been corrected in the valuation.

A. Yes.

Judge Ritz: Is that correct, Mr. Alvord?

Mr. John W. Alvord: I think so. I am not certain. Perhaps not, because I think these were called to my attention after the valuation was made.

A. And again, on page 62, I couldn't find as much poplar moulding around the roof as was entered by about half—half the quantity shown in the inventory. That is a small item, however.

The wainscoting of the engine room I find to be over-estimated in the inventory. It is described in the inventory as being 6 feet high, and I measured it 4 feet 11 inches, except under the windows, where it is 40 inches high.

Judge Ritz:

Q. Does that account for the difference in the quantities you have ascertained?

A. Yes.

348 Page 82, rock excavation for building site, the inventory quantity is 1,080 cubic yards, solid side hill rock. Now, one can't determine exactly how much rock was removed, but the slope—the original slope—ap-ears to have remained as it was both east and west of the pumping station; and measurements which I took to supplement the drawing given on page 135, and calculations from those sections, indicate to me that there was only about 500 cubic yards taken out above the base of the floor of the pumping station. I notice that the line of excavation of rock—the plane of excavation of the rock north of the pumping station almost coincides with the north face of the building; and I measured the depth of rock excavation at the east and west ends of the north side, and the horizontal distance from the north face to the approximate toe of the slope of the original rock surface, as a basis for my calculations.

Page 92, cast iron pipe. On that page there is a statement of the length of 4,500 feet on 10-inch pipe, weighing 56 pounds per foot, 2,930 feet 10-inch pipe weighing 69 pounds per foot, 4,130 feet 10-inch pipe weighing 70.8 pounds per foot; and there follows a statement that only the records of the Beaver Pond line are available for the records of the early pipe lines, and since 1908 the pipe purchased "has conformed to class B, American Water Association standard." Mr. McCarthy showed me a profile of the old Beaver Pond spring pipe line, on which it was noted that there were 350 pieces of

349 Class A pipe, weighing 60 pounds per foot, 540 pieces of class B, weighing 56 pounds per foot, 25 pieces of class C, weighing 52 pounds per foot. Those class designating letters seem to be different from their modern use. But I used those lengths and weights per foot of the pipe as stated on the profile for the tonnage of the pipe in that Beaver Pond spring line, instead of being governed by the weights and measure statements in relation to weight of pipe as given. It seemed to me they were more likely to be correct.

Q. Does that account for the difference between the estimate that you made and the inventory filed?

A. That accounts for substantially all of it, I believe.

Q. Mr. Miller, you said you made a valuation of this property. Did you make a report showing the result of your valuation of the property?

A. I did; yes, sir.

Q. I show you a report marked on the front cover thereof, "Report on the Valuation of Property of Bluefield Water Works and Improvement Company, Bluefield, West Virginia, W. E. Miller, Consulting Engineer, Madison, Wisconsin." I will ask you to state if that is the report you made upon the valuation of this property.

A. It is.

Q. I will ask you to file this report, marked as indicated in the quotation contained in the above question.

A. I file it.

350 NOTE.—The report referred to was filed as evidence, marked as stated, and is hereto appended.

Q. Mr. Miller, will you please state whether or not this report, in your opinion, is the proper valuation of the properties of the Bluefield Water Works and Improvement company—I mean by this, the reproduction cost less depreciation?

A. Well, it was believed to be correct when I submitted it; but believing that I was delaying proceedings, I took a chance on it being correct and forwarded it without as much checking as I would like to have done, and I have since discovered a few errors.

Q. Are those errors in calculation?

A. Yes.

Q. Then with the exception of the errors in calculation, the report, you believe, correctly gives the value of the property?

A. Yes. I will call attention to the items to be corrected. Shall I do so now?

Q. Yes, just go on and give the correction in any calculations.

A. I think I mentioned the other day that I had omitted the lead and yarn for pipe joints in the line from Ada springs to the city, which is mentioned in my report on page 16.

Q. How much should be——

A. The lead omitted there—lead and yarn—amounts to $2,808.

Judge Sanders:

Q. You mean that is to be added to your estimate of the value?

A. That is to be added to my reproduction cost.

351 Judge Ritz:

Q. You will please state what item on page 16 that should be added to.

A. That belongs to item 9, sub-division B.

Q. There should be added to that item 9, sub-division B, an item for lead in the pipe joints, $2,800?

A. $2,808.

Q. $2,808. All right.

A. And lead and yarn was omitted for the pipe joints on the Beaver Pond spring line, item No. 10, page 17. That amounts to $277.

Q. It is to be added to that, you say, for lead?

A. $277.

In the boiler plant of the Ada pumping station, item 18, page 21, I discovered that I started to figure the price for each boiler separately, intending to multiply by two, but I added the cost of one boiler to the setting of both, and I have omitted the price of one boiler—that is, the metal work, iron and steel for one boiler, necessitating an addition to my figures of $1,600 for that item.

Q. That is boiler plant at Ada?

A. Yes, sir. That, let me say here, was found to have been the price actually paid by the company for each of those boilers in 1906; and in the light of other information I had on cost of boilers of that kind and size, was a reasonable price to use here.

Q. Was that $1,600 for one boiler or both boilers?

352 A. $1,600 is the price of the steel and iron work only for each boiler.

Q. And, as I understand, you have one of them included already?

A. Yes.

Q. And simply have to add the other one?

A. Yes.

And in item No. 47, page 32 of my report, there is an error in the quantity of steel in the two twin tanks. I have omitted to double the weight of structural steel in the roof trusses, which I computed for one tank only. There should be added 19,630 pounds, at 4½ cents. In other words, the fourth item—the fourth entry under item 47 should be doubled, adding $883 to my cost of reproduction. Now, my quantity of steel in those twin tanks is much larger than is given in the inventory. I have 526,840 pounds, whereas the inventory states the quantity to be 486,000.

Q. You have 40,000 pounds more?

A. Yes. I have actually computed out the number of square feet of steel plate work of each thickness, and applied the weight per square foot to each thickness, and gotten that figure. I have not applied quite as large a price per pound as Mr. Alvord has, but we arrive at substantially the same total cost. In view of a number of contracts that I have seen and have copies of for work of that kind, I firmly believe that the price that is used here, 4½

353 cents a pound, is sufficient to cover that cost; and I find that it is substantially the same as was paid for these tanks.

Q. Now, is that all of the corrections you desire to make in the report?

A. That, I think, is all.

Q. Then, with the——

A. Of course, the addition of these items will increase the total, to which there are some overheads added, usually based on percentage of direct cost of the several items making up the property; and so there would be some overhead cost chargeable on the sum of these additions.

Q. Then, with these corrections made in your report, the only difference in the items of your report and the items of the inventory filed are the ones that you noted a while ago in quantities?

A. I won't say that; I believe there were some other minor discrepancies, which I didn't consider of enough importance to list out, and yet I used a *l*sightly different figure.

Q. Well, there were no substantial differences except the ones noted?

A. No substantial differences.

Q. Mr. Alvord stated in his testimony that the main discrepancies between you, so far as valuation was concerned, was the unit price that you used being a different one from the one used by him. What have you to say about that?

A. Well, in many cases that is true. In many cases the difference is entirely the difference in unit price.

354 Q. Mr. Alvord filed with his testimony statements of the items of difference between your report and his. This is

marked, "Discussions of Differences of the Values" between your report and Mr. Alvord's report. I wish you would take this statement and explain, if you can, the differences between the two reports, and why you arrived at the conclusion that you arrived at in making your report, instead of the conclusion that Mr. Alvord arrives at.

A. There is a large difference between us in item No. 1, where Mr. Alvord has allowed $14,455 as the preliminary cost, being the expenses incurred previous to any actual designing and constructing being undertaken. He has explained what work is to be done under this heading; but I never have been able to feel that there was any particular relation between the amount of that work and the cost of the property that was to be built after the negotiations were completed; and it didn't strike me as reasonable, under the conditions existing here, where I assumed the existence of these springs was a matter of common local knowledge, to require any expert engineering reports on source of supply, or other expert engineering reports of a preliminary nature; so that I have not included in my allowance any expert engineering reports of a preliminary nature. I attempted to find out what expense the company would incur in filing the incorporation papers, and the fees paid for the right to—fees paid on capital stock to be issued, and expenses of that nature,
355 which are required by the laws of the state; and I found that they would be very small. I took into account the fact that the franchise under which this plant was built, and has since been operated and extended, was the briefest franchise that I had ever seen; it didn't seem to me to have involved the expenditure of much time, money, or talent in securing it; and I don't believe that such a franchise would now involve the expenditure of any considerable money. I felt that under the conditions existing here a thousand dollars was a reasonable allowance for the expenses of a preliminary nature. I hardly feel that it would be reasonable in a company to spend nearly $15,000 in finding out whether a project to building a water works for a city of 15,000 people was feasible or not—would be justifiable.

My figures on the values of the real estate of the company are necessarily somewhat uncertain, more so than on the rest of the items, but they are based upon knowledge of what was paid for the several parcels of real estate, the time the company has had them, and some information given me by Mr. Crenshaw, of Bluefield, as to the changes in prices of real estate in and about Bluefield during those intervals for which the company has had these parcels, and other present conditions as to values of real estate given me by Mr. Crenshaw. They are not his figures—that is, the figures I have presented for real estate values here are not his figures, but they are in-
356 fluenced by information which he gave me, and by the original costs. I have, I think, in all cases put a somewhat higher figure on each parcel than was paid for it, allowing that there had been some increase in each case, depending upon length of time since its original purchase and its location. Some of these parcels of real estate I have stricken out or omitted from the column headed

"cost of reproduction new less depreciation," because I considered that so far as water works service was concerned they had depreciated to no value for that purpose.

Q. Now, before you get off of that item, Mr. Miller, did you omit any of these pieces of real estate for water works services that Mr. Alvord didn't omit? I believe Mr. Alvord has omitted some of them too.

A. Yes, I omitted some that he did not omit.

Q. Now, I wish you would take up those that he didn't omit and state why you do not think they are of any value for water works service.

A. The first item of that kind which I see is spring tract No. 20, on which I put a reproduction cost of $100. Mr. Alvord has $25 for the land alone, my figure including the spring on that land. I omitted that from the present value altogether because the spring is condemned and not used and the land can't be used for the purpose for which it was acquired—water works purposes. I
357 know of no use to which the company can put it in connection with the furnishing of this service; and I therefore omitted it.

The same is true of spring No. 22, on which I put a reproduction cost new of $1,500, against Mr. Alvord's $25. He has retained that item—both these items in his present value.

Another item I have omitted——

Q. Why did you exclude that item?

A. Because the spring is not used.

Q. Well, is it useful?

A. No, I understand it is not. My information is that it is not.

Q. Well, what is the reason?

A. The spring is polluted, I am informed.

Q. What spring is that?

A. Spring No. 22, that is the one just east of the Ada pumping station along East River.

Q. That is the Estill Bailey spring?

A. I presume so.

Q. The one that Mr. McCarthy talked about as having been polluted by the city?

A. Yes, sir. I think perhaps I was confused in my discussion of spring No. 20. I then had in mind that that was the condemned spring. That is spring No. 22. Spring No. 20, I understand, was never completely developed, and has not been used and is not being used. I didn't consider it used or useful, and omitted it.

The next item which I have omitted and Mr. Alvord has
358 not is 99.36 acres purchased at site of reservoir and dam. The dam having become useless, obsolete, and abandoned, I considered the tract of land purchased for that purpose as in the same class with the dam.

Q. Do you consider it useful for any other purpose in connection with furnishing water to the city?

A. I don't know of any use to which that can be put unless the dam can be reconstructed and used for the purpose for which it was

originally acquired. It seems to be not used or useful at the present time.

Those are all of the parcels of land which I excluded that Mr. Alvord has not, but there are some improvements—buildings and improvements in the same category. Among them would be the one-story cottage of three rooms at Ada pumping station. The inventory states that it is in bad repair. I saw it, saw that it was not used, and was not in condition for use. Some of the roof was gone, some of the floors were gone, some of the walls were gone. It was a cheaply built frame cottage sitting on posts near the Ada pumping station, projecting over the edge of the creek, if I remember aright.

Q. And if you were restoring this plant or reproducing this plant at this time you would not reproduce that cottage as part of it?

A. I certainly would not. I have figured its original cost here, given a figure of $300 in my cost-of-reproduction-new; but
359 I considered that it had depreciated the amount of that cost, and left it out of my present-value column.

The same is true of the tool house at spring No. 6.

I didn't put a separate value on the house, barn, crib, spring house, orchard, fences, et cetera, on the Henry Bailey farm. My information was that those improvements were all there when the farm was bought. The farm was bought as an improved farm; the cost of those improvements were reflected in the price paid. I have included the farm at an increased price over that paid, and considered that my figure included those improvements.

Q. Mr. Miller, are those improvements now used, or are they useful to the company in furnishing water to the city?

A. Well, I am informed that one of the company's employes lives there, but these buildings, these orchards, some of these improvements would not be necessary to an employe of the water company. They were apparently put there by the farmer who originally lived there; and for water works purposes I wouldn't consider them as of any use or value. And as to the price of that house, I did make an estimate of the reproductive cost of the house, and it was less than half of Mr. Alvord's figure of $2,000. That house is only a little larger in plan and in cubical contents than the cottage at Beaver Pond spring; and it is a very little more expensive type of
360 construction—quite similar in type of construction; and my figure of reproductive cost of that house, after adding an allowance to cover contingencies, as I believed, was $900. I have not considered more than a thousand dollars as a reasonable figure for that house, cost of reproduction.

Q. New.

A. The inventory states it to be an eight-room house, and the employe who lives there, or lived there in January, told me it was a seven-room house. I haven't inspected the interior of it, but I have passed by it and seen it, and it is illustrated in the inventory.

Q. At any rate, you have included the value of this farm and the improvements as one item in your report, and have not undertaken to include the improvements separately?

A. That is true.

185

Q. Before we pass from that farm, how large is that farm, Mr. Miller?

A. It is described as 236.25 acres in the inventory, page 12.

Q. I wish you would state whether or not that farm as a whole is useful for the purpose of furnishing water to the city.

A. Well, it undoubtedly has an effect in preventing contamination of the water—the waters of the Ada spring—to a greater extent than if the company didn't have control of that land.

Q. Then you consider it is useful for that purpose?

A. I think so; yes.

361 Q. Preventing pollution?

A. Yes. At least, in part; I am not sufficiently familiar with the topography there—topography and geology—to see that the whole of it is really needed for that purpose.

I haven't put any separate value on the farm house and tool house on Ruble farm, as Mr. Alvord has done. I have included the cost of those improvements in the price put on the farm. They were on the farm when the company bought it, according to my information. The farm was bought as an improved farm, to the extent of those improvements; it was bought only a comparatively few years ago, at a price of less than $350, although there is 46½ acres in the farm. I have put that item in at $500, cost-of-reproduction-new, and retained in the present value column $100 of that, for the reason that the farm was purchased so that the company might acquire the riparian rights to the stream from Jarrell spring, and retained those rights, selling the farm, as it would have no use to them.

Q. Well, if the Jarrell spring is not used or useful for water works purposes then this would have no use for water works purposes in this connection?

A. I think that would be true Mr. Alvord puts a larger present value on the farm house and tool house—in fact, nearly

362 double the price originally paid for the farm with those improvements. Now, those are all of the items, I think, under the head of real estate and right of way, which I have omitted and which Mr. Alvord has included; but there are one or two other items that I would say a little about. I carefully estimated the cost of construction of such a one-story frame cottage as that at Beaver Pond spring, and made what I considered a liberal allowance for contingencies after figuring out the amount of materials and estimating the labor involved in constructing that cottage. I reduced it to the price per square foot. I expressed the value in a price per square foot ordinary valuation for the reason that I assumed that Mr. Alvord would do likewise, inasmuch as the inventory had given its area, and that is sometimes the method of engineers in figuring buildings, to express the cost on a basis of so much per square foot for that particular type of building, or the cost per cubic foot; and I figured it out carefully, based upon prices of lumber particularly that were furnished me by local parties. The Georgia Lumber company gave me a schedule of lumber prices that are in effect here. I also got other similar figures from another lumber company here in Bluefield as the basis of my estimating on any structures requiring

lumber. I figured out the cost of the Beaver Pond cottage rather carefully; I reduced it to a price per cubic foot and per square foot as a basis of an approximate estimate of some of these other
363 cheaper structures, such as the cottage at Ada pumping station and small farm buildings.

In regard to the office building, I made a very careful analysis of the cost of that building—probable cost of reproduction, I mean to say. The building was built in 1914, I am informed. In fact, I went there and examined the bills paid for various parts of the work; and inasmuch as that was of such recent construction, I used the actual cost of a number of things—a number of parts of the structure. For example, I had the amounts of the bills of the Georgia Lumber company for the doors and windows and the contract price of the wiring and lighting and fixtures, and the Whitlow bill for painting and papering, and the Bluefield Tinning and Plumbing company's bill for roofing of the office building and garage, and for other data—other parts—I got figures from local parties who do work of that kind, so that I feel sure—and after making that analysis I added something for good measure—contingencies. My total was originally $4,218, which I understand was more than the building cost, and I called it $4,500. I see Mr. Alvord has $800 more than that for the sum of the two buildings. You wish me to go right through explaining the items?

Q. Yes, just go through and explain how you arrived at your conclusion in regard to all these items.

A. In regard to the springs, owing to the fact that in each
364 case—in the case of each spring there were so many items of similar nature, and other cases, I grouped the various kinds of improvements on all the springs of each group, and figured the cost somewhat differently from what Mr. Alvord has done, where he figures the improvement of each spring separately. I have shown the grouping of those items in my report on page 11-*a* and 11-*b*.

Under the item No. 3, gravity springs, I find a total of 1,243 8-foot chestnut posts, the price of which I obtained from local lumber supply concerns, and to that price I have added 20 cents each for hauling, carrying such distance as they would be carried, and setting. The price of the fence wire I also obtained from a local hardware supply house, although I had some data on material of that kind; and to the rest of the items I applied such unit prices as seemed to me to be adequate to cover the work under the conditions which governed it. Mr. McCarthy showed me a statement—allowed me to make a copy of the statement of the cost—actual original cost—of the improved springs, and I have always been somewhat uncertain as to just what items—as to the extent of the work, I should say, and materials covered by the figures which he gave me. I understood that the company was unable to show any analysis of the cost of the several kinds of work and material involved here, and had nothing but my own judgment as to the unit prices applicable to the various sub-divisions and the total cost as given me by
365 Mr. McCarthy.

Q. Well now, you say you had nothing but your own

judgment, Mr. Miller. What do you mean by that? Do you mean that you didn't make any inquiries about the cost of labor and cost of materials here?

A. Oh, no. Of course, I had information as to the current rates of wages paid here for various kinds of labor, but under different conditions the same rate of wages for labor would make radically different unit cost; and I had to apply my judgment, of course, to the conditions and the rates of wages current here in Bluefield to get unit prices to apply to these quantities. Now, one can't go over the ground today and see just how much grading has been done, how much rock has been hammered to pieces by hand hammers, and so can't determine the accuracy of the quantity stated here in the inventory for the various kinds of work and materials involved; but I have based my total estimate on the quantities as stated in the inventory, assuming them to be as near correct as anyone can now determine them to be. I think, however, there is enough uncertainty about the quantities and also about the unit prices to be applied to justify a statement that no estimate—no matter by whom made, is as good evidence of the cost of reproduction of that work as the original cost, if it could be ascertained, modified by such changes in the prices of materials and labor as has occurred
366 in the mean time, or since the work was done. That is work of a very difficult nature; it is very unusual work, and work of a kind on which it is practically impossible to get any real reliable unit prices.

The same is true of item 4, Ada springs, that this work is all of a very unusual nature; it is up on the mountain side, and materials have to be carried to considerable distances. I would call attention to the last three columns on page 11-*a* of my report. In the third column from the right I have tabulated the distances stated in the inventory as the distances which the materials had to be carried, and they range from no entries at all in some cases, and from 300 feet to a thousand feet. There is one spring, spring No. 2, where the distance to carry materials was a thousand feet. Two other springs involved the carrying of materials 800 feet in each case. Seven springs involved the carrying of material 500 feet. I went over the ground and verified this, checked those descriptions, and I think they are about right. Those are not extremely long distances to carry the comparatively small quantities of materials involved.

Judge Ritz:

Q. Those are the distances, I believe you stated, that you took from Mr. Alvord's inventory?

A. Yes, sir.

Q. And you checked them for their accuracy?

A. Yes, sir. I have noted on this page 11-*a*—noted the
367 dates of purchase of the springs, and the dates the improvements were made. It appears that the improvements have all been made since 1906.

Q. From whom did you get that information as to the dates?

A. From the inventory. I note that the statement shown me by

Mr. McCarthy for the amount spent on improvements had no entries for the years 1904, '5, or '6, and that the cost from 1907 to April 1st, 1915, for the gravity springs, amounted to $8,034.05, and for the new springs $16,829.44, making a total of some $25,000 almost; and Mr. McCarthy informed me that those amounts included the pipe lines down from the springs—in the case of the Ada group, down from the Ada spring itself. Taking the history of the development of the gravity spring group—taking that history into account—I could not believe that the cost shown for that group included very much of the pipe lines down from the springs, but on my estimate, only last night, I made a tabulation of the items which according to the information I had made up the work covered by these costs shown me by Mr. McCarthy, and against about $25,000 I had a total of about $44,000.

Q. In your estimate?

A. Yes.

Q. How much has Mr. Alvord in his estimate against that item of $25,000?

A. I haven't made up the corresponding figures from Mr. Alvord's report, because I wasn't able to pick out the—Well, I might
368 have been able to pick out the items to the corresponding items, but it involved some sub-divisions of items in my report. I have entered the improvements of springs 22 under item 4, page 14, at $1,600. Included in the figure given me by Mr. McCarthy for the total expenditure for plant account on new springs, is an item of $1,568.47 spent in 1907 on spring 22; and I didn't analyze the work involved there in the development of that spring, inasmuch as I considered the spring depreciated to no value: I simply put it in here at approximately the same figure as was spent upon it originally.

Q. That is, the spring has been taken out of use because of its pollution?

A. Yes. I will go to item 9, page 16, pipe lines Ada springs to city. There is a comparatively small difference there, and there should not be much difference; it is a matter of tonnage and price per ton of pipe and specials, although there was a few valves included. I have explained in the text of my report how the price per ton used by me was derived.

Q. Is your price per ton different from Mr. Alvord's price per ton?

A. I have used $26 per ton for the 6, 8, and 10-inch pipe on cars at Bluefield, and I have allowed an extra of $2.50 a ton for hauling from cars to place of use. I believe Mr. Alvord figured $26 including cartage. There is considerable difference between us in the item of laying pipe, sub-division B of item 9. The differ-
369 ence won't be as much as it appears here when my correction of $2,808 is made for the lead and yarn omitted, although that would still leave Mr. Alvord's estimate nearly double mine. I believe that the prices I have used here ought to cover the cost. I have not been able to ascertain what the original cost of that work was. It seems it was impossible to segregate it from the accounts. There will be a rather small difference between us when my collection

of $277 is made to item 10, page 17. That, again, is pipe line, being the Beaver Pond line. My total as corrected would be $3,863, against Mr. Alvord's $4,174.

There is considerable difference between our estimates on the Ada pumping station building, which is due in part to our differences in quantities of excavation and in concrete work and other work, and in part to differences in unit prices. If my calculations of quantities are correct, part of our difference is justifiable in that way.

Mr. Fox:

Q. The excavation at the Ada station was included in the stipulation, wasn't it, of differences that we went into before we entered into this matter?

A. Yes.

There is another item of difference that I didn't—that is not in the stipulation, in regard to steel stack foundation, item 12. I couldn't calculate but 165 yards of excavation, figuring from the original surface, four feet below the present surface. The
370 inventory shows 187 yards of excavation there, and I didn't find but 75 yards of concrete, according to the plans of the foundation. I calculated the weight of the steel plate work, the ladder, and the cast iron in the base wrong, and in the anchor bolts; and in correspondence with the builders of that structure found out that the weights as they had them were a little more than I had figured. According to their statement the total weight of all those three items of steel and iron exceeded mine by 2,817 pounds. I would be inclined to make an addition of that weight—that extra weight, above what I calculated, because I assume that it must be there. For the amount of fire brick and red brick I have relied on the inventory. I might say that I had information as to the contract price of that structure, as well as numerous others of the same or similar nature. There is comparatively large difference in our unit price of a small item, under heading of coal chute, item 13, 127 *suq*are yards.

Woven fence wire in roof, I figured that at 5 cents a square yard, Mr. Alvord, 50. For 32 cents one gets a rod of 52-inch width of fence wire, which would make several yards—I haven't figured it out—so it couldn't be 50 very well. There is not much labor involved in placing it; there is some, of course.

You wouldn't wish me to discuss all of the items—only those on which there was a material difference?

371 Judge Ritz:

Q. Yes, just the ones on which there is substantial difference. The others there is no use talking about.

A. The Worthington pump is entered in my valuation at a reproductive cost of $900, to which I have added other items for the foundation and the bed plate and suction and discharge pipe, as per inventory. Mr. Alvord includes an item of $1,200 for that pump. I know the actual cost of a number of pumps of that type and similar

size which would run very close to $900, or less. I think I have made an ample allowance for that here. I don't know what the pump originally cost. I believe the inventory is in error in regard to the dimensions of that pump, having two of the figures reversed.

Judge Ritz:

Q. What figures are they?

A. The inventory states the diameter of the steam cylinders 20 inches, diameter of the plungers, 15 inches, length of stroke, 10¼ inches. That 10¼ inches is probably the diameter of the plungers, and the 15 inches is probably the stroke. I had to change the dimensions in that way in order to get the capacity as stated, one and a half million gallons per day.

Judge Ritz: That is correct, is it, Mr. Alvord?

Mr. Alvord: I should think so. His criticism is proper.

The Witness: My price of $900 is based upon a reversal of those figures—a pump of the dimensions which I assumed this to
372 be with those figures reversed. I think I have already mentioned the correction to be made to my item No. 18, boiler plant, page 21, to which there must be added $1,600, which would make my total cost of reproduction new $5,917, against Mr. Alvord's $7,444.

Judge Ritz:

Q. How do you account for that difference?

A. A little of it is in the piping. I have $107 against Mr. Alvord's $188.54, and the rest of it seems to be principally in the boilers and settings—brick work of the boilers. An addition of $1,600 to my item on boilers and settings would make $5,433, against $5,848, or a difference of $415 there. My figure will have included the steel and iron work on the boilers at the contract price, which, in view of other data, seems to be a reasonable price to use now.

Q. Well, what data did you have to fix the value of those boilers?

A. Well, I didn't bring along all my data.

Q. What did you have to base your judgment on?

A. I had the contract price of numerous other boilers in other places, boilers of that type and size. Unless Mr. Alvord put the steel and iron work in at a larger price, our difference would all be in the brick work, the settings of the boilers. Now, while I have stricken out the land and the development of spring 22, I have not stricken
out all of the—haven't fully depreciated, to nothing, I mean,
373 the connection from that spring to the pumping station, because there is a considerable tonnage of pipe and some valves and fittings which could be comparatively easily removed, and would be useful elsewhere.

Q. You have put those in at their value for use in other places?

A. Yes, I have $100. The total cost would be $118 for the material there. Our principal difference—our large difference in the

total for item 22 is principally in the amount of that rock excavation for the foundation of the building.

Q. You have already explained that?

A. Yes. I have depreciated it to nothing, as of no present use or value, to items under item 23, station miscellaneous, whereas Mr. Alvord has treated those quite differently. One is the Wyman simplex 6 by 3¾ by 8 inch pump, which has been standing idle there in the pumping station for years. It was bought for construction purposes, I understand, and is not being used and is not connected up with anything, and I don't see that it has any value now beyond what could be obtained from the sale of it, since it is not used or useful. And in the yard of the Ada pumping station is an old boiler, an eighty-horse-power boiler, which I understand has been sitting there for ten years, having been taken out of the old Ada pumping station. I would depreciate that to nothing; no present value.

Q. Not used or useful in connection with the present
374 water system?

A. No. Mr. Alvord considers that useful, along with several other useful items. Now, my treatment of the estimate on Beaver Pond station, item 22——

Q. 24.

A. 24. —was influenced by my knowledge of the fact that the company was preparing to abandon that station; its usefulness had practically expired; and therefore I depreciated it quite heavily.

Q. Well, in view of the fact that it has been shown that it has been since abandoned, was your depreciation correct?

A. I believe so. There might be enough salvage there to justify the figure at which I have put it into the present value column, $61, even though there was no real use for the building as it stands.

Steel stack and bridging is in the same category.

Mr. Alvord's costs are a little below mine on items 26 and 27, but mine are below his on item 28. Only within a comparatively few days I decided to write the builders of the two boilers that are in that station to get some supplementary data on boilers of that kind, although I thought I knew pretty well what they would be worth; and I have a letter from the builders of those boilers—that is, in reply to an inquiry of mine, in which I asked for the original price and an average—reasonable average price during the five years preceding the date of this valuation. I will read that letter. (Reading.) "We are unable to locate the boilers you refer to on our
375 order book, and we think you must be mistaken about one of the boilers being 60-inch diameter by 16 feet long, as we never put 64 tubes in a boiler 60-inch diameter." The description I gave them was as given in the inventory. I hadn't thought there was any error there; I didn't discover any error in the description of those boilers as given in the inventory. They go on to state in this letter, from the Erie City Iron Works, "In 1891 the approximate price of a 54-inch by 16-foot boiler with 100 pounds working pressure, with fixtures complete, including wall plates and rollers, was

$465. In 1909 the price of the same was $500. In 1914 the price was $490."

Q. What price did you use in arriving at this valuation?

A. My price is $1,100, including the boiler complete with its setting.

Q. What was the price that you used for the boiler?

A. I contemplated a price of about $600, delivered at the place, and $500 for the setting.

Q. Well, how about the other boiler? Did you use the price or a larger price than that given by the manufacturer?

A. Why, the price I included there is practically the same as given for that other size in this letter.

Q. And that is in excess of the price at the time the boilers were actually purchased?

A. Well, there has not been very much change. There has been a little increase.

376 Q. Well, you read there $465 in 1891, and you said you used $600. That is a pretty substantial increase, isn't it?

A. Yes, but these figures in this letter are f. o. b. Erie, Pennsylvania, the builders' works, and there is freight and hauling to be added to get the boiler at the station. The same letter gives the prices for the other size. The 100-horse-power Erie City Iron Works horizontal tubular boiler in 1891 was $670, in 1909 $680, in 1914 $630.

Q. Well, what price did you use in arriving at your estimate you have made of the value of that boiler?

A. I contemplated about $750 for the boiler on the job.

Q. That is $120 more than the price in 1914?

A. Yes.

Q. Do you think that would cover the freight and hauling?

A. I think so, undoubtedly.

Q. What is the next item on which there is a substantial difference?

A. Well, in percentage there was a substantial difference in several small items, but I don't think the amount—the actual amounts of difference are enough to justify much discussion of them.

Now, coming to item 32, there is a difference of 144 tons and——

Q. Well, there is no substantial difference between you on that? Mr. Alvord has it $43,989; you have it $43,103.

A. Yes. I have a smaller tonnage and a large price per ton.

Now, going to item 34, the laying of pipe. I have had a

377 great deal to do in the way of estimating on pipe laying under a great variety of conditions, and have obtained the actual cost of a great deal of work of that kind under various sets of conditions which were also ascertained. In other words, I have had occasion to make analyses of the cost of pipe laying in a great many different places under many different sets of conditions, both as to rates of wages of labor, the kind of labor, and the depth at which the pipe was laid, and the character of soil and material encountered in digging the trenches, and, of course, I found that a set of pipe

laying prices applicable to one case would not be applicable to another. Each set of conditions must be determined, and prices made according to these conditions.

I made inquiry as to the rates of wages paid for labor here, and it seems to be between $1.50 and $1.75 a day for common labor. In Wisconsin it has been two to two and a quarter a day during the last few years, and even up as high as $2.50; and naturally, if the conditions were the same as to kind of material encountered at that depth at which the pipe was laying, pipe laying here would be cheaper than what it is up there, owing to difference in rates of wages.

I think perhaps it might be in order for me to give a little supporting data in connection with the figures I have used on the
378 ordinary work here, or the work where the conditions might be called ordinary or usual, extra allowances being made elsewhere for the unusual conditions of rock excavation and shale excavation and wet work. While, as I have said, I have had the opportunity to collect actual costs and knowledge of conditions for pipe laying in various places, I am going to mention only one as typical and make a little analysis of that. I have here the prices paid by the city of Milwaukee to contractors for the laying of water pipe in Milwaukee according to the city's standard specifications, which call for the furnishing by the contractor of the lead and yarn for the joints, the furnishing of all tools, implements, sheet piling, if any required, all the labor—in fact, everything except the pipe and the specials and valves, which are furnished by the city to him on the job; and the specifications called for the laying of the pipe with its center 6½ feet below the street grade. In 1906 the contract price which applied to all the work of that kind during that year was 31½ cents; in 1907, 29.9 cents; in 1908, 27.75 cents; 1909, 31½ cents; 1910, 32 cents; 1911, 30.75 cents; 1912, 29½ cents; 1914, 32½ cents; 1915, 32 cents. The average of these is 30.8 cents.

Mr. Alvord: What size?

A. This applies to 6-inch pipe.

And there in Milwaukee it has been the custom for many
379 years to call for bids in the early spring on the laying of all pipe which the city may decide to lay during that year—may subsequently decide to lay during that year. The contractor then does not know upon what streets he is going to be called upon to lay pipe for his figures, and these figures exclude any extra—any claims of extras by reason of having to encounter any rock work or any paving or any conditions. All conditions are covered by the contract price made in the spring for the season's work.

Commissioner Northcott:

Q. What depth, Mr. Miller?

A. The center of the pipe 6½ feet below the street grade. Now, it is presumed, of course, that the contractor expects to make a profit. In my estimate on pipe laying I customarily add 15 per cent for the contractor's overhead expenses and his profit. Now,

I deduct the allowance to that extent in this case from this average of 30.8 cents to get what would be the contractor's actual cost, excluding overhead and profit, amounting to 26.8. That includes the furnishing of the lead and yarn for the joints, as well as the digging of the trench and laying the pipe; and for the laying and handling—handling and laying pipe I allow 3½ cents in addition to the 5.8 for the lead and yarn for the joints, making a deduction of 6.8 from this direct cost of 26.8, leaving the cost of laying ditches and trenches, 18.1. In order to lay that pipe the trench would have to be 6.9 feet deep and practically 2 feet wide, making
380 a half yard of excavation per lineal foot; so that his allowance there of 18.1 for a half yard per foot would amount to 36.2 cents per yard, while he has paid $2.25 a day to common labor, 36.2 cents a cubic yard. Now, I figured that under the conditions here where there was no rock work or shale or pumping of ditches required, taking only the ordinary conditions, and with wages at 1.50 and $1.75 a day, 35 cents a cubic yard would be a liberal allowance for the cost of excavating and back filling; and I have built up a set of unit prices which I have applied here on that basis, including the lead and yarn for joints and an addition of 15 per cent for the contractor's overhead and profit, and I have made my allowances in item 37 and 38 for the unusual conditions; and I feel that these unit prices ought to cover the work here. I was unable to obtain from the company any actual—records of actual cost of any particular extensions of pipe lines, and was necessarily guided wholly by other data and judgment.

Going to the next item, of galvanized pipe in street mains, item No. 35, there is considerable difference there, nearly $2,000 between us; and my figures, I believe, were based upon what—were substantially the same, if not exactly the same, as the company was paying for pipe of that kind bought here in Bluefield through a local jobbing house, and which I found were practically the same
381 as a five-year average at the mill, plus freight on a less-than-carload basis. I have collected a great deal of data on the cost of wrought pipe as well as cast iron—made quite a study of it. There is a standard list of prices of the different sizes, and there are published quotations—there are quotations published weekly as to discounts from that list for pipe in carloads at the mills, and for less-than-carload quantities at the mills; and I have worked out a new price per foot of each size and each kind of wrought pipe with ever- change in discount for several years; and I am very sure that I know about what that pipe is worth, and I know what the company was paying for it in 1914 just previous to this inventory date. I haven't put this valuation on the same basis that Mr. Alvord says he does—that is, in reference to this item I have not put it on the same basis of his—namely, buying in carload quantities and constructing it as a wholesale proposition. My figure will include the extra cost due to purchases in small quantities. I figure out here what would be the cost if purchased in carload quantities at the mills, with freight added, and found that my figure shown in the valuation is about 10 per cent above such cost. I think possibly our difference

may be due to my figuring on steel pipe, which it appears from the prices being paid by the company indicated that they were getting steel pipe—buying steel pipe. Possibly Mr. Alvord has
382 figured on genuine wrought iron pipe, and there is a substantial difference between the two in price.

Judge Ritz:

Q. Well, there seems to be some difference between you as to the laying of this galvanized iron pipe. Did you arrive at the cost of laying this substantially in the same way you did at the cost of laying the cast iron pipe?

A. Yes. In this case there is no lead or yarn for joints. The pipes are screwed together. Of course, the threads are lubricated with red lead and oil.

Q. There is also quite a difference between your estimates for unusual excavations?

A. Yes.

Q. I wish you would explain the differences in that regard.

A. Yes; but before doing so, it occurs to me that I should have stated in connection with item 37 that I was furnished by Mr. Wiles, the city engineer of Bluefield, with the cost of various jobs of sewer work here in Bluefield, nearly all of which, I think, were somewhat deeper than the water pipes were laid; and I made some analyses of the—some investigations of the conditions there and the analysis of those costs, as far as I was able to. My figures here for pipe laying and the water system are based upon a cover of two feet over the pipe, the pipe being buried two feet. Of course, there is quite a difference between the cost of work of that depth and *and* five to seven
383 feet, as we have it in Wisconsin. There will be also quite a difference between the cost of laying the pipe with two feet of cover and pipe with four to six feet of cover, as is the sewer work here in Bluefield, I believe. I have taken the amounts of solid rock excavation and excavation of shale in trenches, lineal feet of trench pumping, as stated in the inventory, and applied to those quantities what seem to me to be ample unit prices to cover the work under the conditions as I see them here. My allowance for rock excavation is $3, whereas Mr. Alvord figures $2.50, although he uses $3 a yard on the excavation of rock at Ada pumping station building site, which is side hill work, and much more—can be handled in larger quantities and more rock moved per shot than can be removed from trenches. My allowance of 25 cents a yard for excavating the shale there, as well as the price of $3 per yard for rock excavation in trenches, is in addition to the 35 cents a yard on which I figured the whole work. These are merely extras.

Q. Then these unit prices you have given here, in order to find out what you allowed for laying the pipe in a particular instance, would be added to the unit price for laying under ordinary conditions?

A. Yes, yes.

Q. Now, the item of steam railroad crossings, there seems to be very little difference between you.

A. No; there is a considerable difference in percentage,
384 and a fairly substantial sum between our figures on 39.

Q. Street railway crossings.

A. I don't feel that those street railway crossings involve so much extra expense over the price per foot of straight, unobstructed work as Mr. Alvord's figure would indicate. We put on them here what I would consider a reasonable extra cost above the regular straight work prices. The contractors in bidding on work of that kind, to my knowledge, have never claimed—never bid any extras on making crossings of tracks—under tracks. They frequently encounter work of that kind in the prices that we find they get for making extensions anywhere, and these obstructions are made and covered in the prices they get.

Q. In the next item there is quite a difference, I notice. I wish you would explain that.

A. There is a difference based upon principle. It is a fundamental difference. I have worked on the theory of reproduction assuming the conditions—physical conditions—to be as they were when the plant was put in, so far as I was able to ascertain them. That principle has been adopted by the—by numerous legal authorities—too numerous, in fact, to justify me in departing from it, I thought. There are too many legal authorities that have denied the paving item as a reproductive—as an element of value, I should say, in a case of this kind, to justify me in wasting any time
385 on figuring up how much that element of value might be.

Q. Well, did you ascertain the actual amount of pipe that was laid under paving originally?

A. Yes. This estimate of mine is based upon information given me by Mr. McCarthy that the 8-inch pipe laid on Federal street from Princeton to Raleigh was the only pipe they had ever laid which involved the cutting and replacing of pavements in the city.

Q. And you estimated the value of doing that work?

A. I did.

Q. And that is all the allowance you did make for cutting and replacing pavement?

A. It is.

Q. Is your estimate a liberal one for that?

A. I think so. I don't know what that work actually cost.

Q. That 75 cents that you allowed for that unit price is in addition to the price of digging the trench and laying the pipe?

A. Oh, yes. I notice on Mr. Alvord's price on brick paving with cement foundation is 70 cents a foot.

Q. Five cents below what you allowed?

A. Yes, sir.

Q. And the difference in that item is due to the fact that Mr. Alvord included the cost of taking up and relaying the pavement over all the mains where paving now is?

A. Yes, sir.

Q. And involved simply a question of principle, as you say?

A. Yes, sir.

386 Q. The next item is no substantial difference?

A. Not much difference in amount on item 42, although it made quite a little percentage.

My item 43 is larger than his, due, I think, to my inclusion of the fitting at the main to the pipe between the main and the hydrant, which perhaps Mr. Alvord did not include.

My estimate on item 44, services and fittings, was based upon what I understood to have been the fact as to who paid for the services here. I appear to have had a misunderstanding as to that, and this is another item of mine that is subject to correction—honest correction—and should be changed by the addition of the cost of a number or services which the company has put in at its own expense.

Q. Your item, then, should include, according to your theory, the cost of putting in the services which the company did put in?

A. Yes, that is it.

Q. Mr. Alvord's item includes not only the cost of the services that the company put in, but the services that were put in at the expense of the property owner, I believe?

A. Yes.

Q. That is the difference between you on that?

A. Yes.

Q. That involves a question of principle likewise?

A. Yes. By the way, I have not determined, as I might have done recently, what my figures would be on the number of
387 services the company has put in. I didn't know until this week that the company had put in any.

Q. Could you make a calculation of about what you think that should be and give it this afternoon?

A. I will be glad to make an estimate.

NOTE.—At this point, it being 12:25 o'clock p. m., a recess was taken until 2 o'clock p. m. of the same day, at which time this hearing was resumed as follows:

Q. I believe, Mr. Miller, the last item you had was the unusual excavation over these services, and cutting pavement, which Mr. Alvord figures about $24,395.

A. Yes. Well, I have included in that, too, what was my understanding as to what the company had done at its own expense, which I subsequently learned was a misunderstanding. I have included only the furnishing and placing of the corporation cocks in the mains.

Q. Well, Mr. Alvord, I believe, testified that his information was that there was no pavement cut for the purpose of putting in these service pipes, and that being true, the estimate that you will make for putting in those services which you omitted will cover all of this item, as well as the preceding item?

A. It wouldn't cover pavement, under my theory.

Q. It is put upon the condition that there wasn't any paving cut?

A. Yes. I presume I will have to pass that item for the
388 present, pending later making——

Q. Now, meters in service—there is practically no difference between you on that?

A. There is a small difference, but there, again, I note an error in the inventory. The total number of meters of all sizes and kinds is entered at 1,467, but my addition of the numbers of different sizes and kinds gives 1,567. I notice Mr. Alvord has added an installation charge on each of 1,467 meters. I have included the installation charge in the different prices that I have put on the different sizes and kinds.

Q. Well, did you figure these meters at the actual cost at which they can be procured and allow a reasonable item for installation?

A. Yes, I did. I have, I believe, entered all of these—I have entered some of them, I believe, at list prices, although there is some discount obtainable on every kind, I believe, in some way. That is in line of the information I have; and we are not far apart on the total.

Q. In ascertaining all these values—the differences not being great in the remaining items—where it is ascertaining values of physical properties, I will ask you to state if you procured, as far as you could, the actual cost of such articles as were necessary to be furnished in order to do this work and added thereto a reasonable allowance for the doing of the work based upon the facts
389 that you ascertained, as you have heretofore testified to?

A. Well, I obtained substantially all the data as to actual cost of materials recently purchased and work done that I understood was available. I don't recall having asked for or obtained any information as to the prices paid for meters by this company.

Q. I don't mean as to the prices paid, Mr. Miller. You misunderstand me. I meant at the prices for which they could be procured.

A. Yes, yes. I have information of that kind on everything included in this property in the way of material. That same error of a hundred in the total number of meters occurs again in item 46, the number of meter boxes installed. I have a hundred more than Mr. Alvord has, but I have——

Q. I notice in item No. 53 there is quite a discrepancy between the figures given by you and Mr. Alvord, this item being for engineering and superintendence, and I believe that Mr. Alvord's statement of it was—at least, what his basis of it was, would be the expenses of constructing the plant and engineering expenses during construction. I will ask you to state how you arrived at that item, as obtained in your inventory.

A. Well, I meant to cover the same cost that Mr. Alvord did, and applied the same percentage, but, of course, to a different total of the preceding items.

Q. And that is what you believe would be a reasonable
390 amount to be expended in the construction of such a plant as is here now, if it was to be reconstructed, for superintendence and engineering?

A. Yes, sir, I do. Five per cent is very commonly used in estimation work for the item of engineering and superintendence, almost universally used, as far as my observation goes; and it is a reasonable allowance.

Q. Administration and legal costs, and general contingent costs. There is some difference between your amounts on these items, but I believe they are accounted for, perhaps, in the application of the same rate of percentage to a different physical valuation. Is that true?

A. No, not exactly. Mr. Alvord's percentage is 2, and mine is 1½.

Q. From your experience and observation, would that be a fair percentage to apply to the physical cost of the work for general administration and legal expenses?

A. I think the allowance I have made in this case ought to cover the costs included under this head.

Q. And that is also true of general contingent costs, is it?

A. Yes, sir. A good deal of care has been taken in this case in compiling a complete inventory, but regardless of the amount of care that may be taken by the one preparing the inventory, there is bound to be some forgotten—some unforseen and forgotten
391 items; and as Mr. Alvord has said, there are likely to be differences in the contingencies, in reproducing the same property, by a different set of people. The human element has its effect.

Q. Mr. Miller, Mr. Alvord has applied to his cost of reproduction new certain rates of depreciation, which I believe he states would amortize the plant in a different number of years, depending upon the particular structure to which it was applied.

A. Yes.

Q. I notice you have also applied certain rates of depreciation. I wish you would state upon what theory you applied these rates of depreciation.

A. My theory is the same as that of Mr. Alvord, which he has explained. It contemplates the setting aside of enough money each year, into a fund assumed to be earning interest, and that interest compounding, so as to build up a fund at the estimated—at the end of the estimated life of the item which will replace that item at the end of that life, or period of usefulness; and I have, in determining the depreciation of each item, attempted to estimate its period of usefulness and the period within which a fund must be built up with compound interest at 4 per cent to renew that item at the end of that time.

Q. You have adopted, then, exactly the same plan, so far as this depreciation item is concerned?

A. Yes, but possibly some differences in the length of different periods of usefulness.

392 Q. Well, in making your valuation, I wish you would state whether or not you gave to these various items the life which your experience teaches you they ordinarily have, under conditions similar to those that exist here.

A. I have taken what I considered to be a period of usefulness of each item, as near as could be determined, being influenced not only by the rate of actual physical decay, but the changes in conditions which will shorten the actual period of usefulness below that which it might have from the standpoint of physical decay only.

Q. Now, just what do you mean by that?

A. Well, to take an illustration—Take, for example, this Beaver Pond pumping station. So far as the rate of rot of the materials in the building is concerned, that structure would have a very long life as compared with the period of usefulness which I have considered it to have in this case. It actually has had a period of usefulness of something like 20 years, if I remember the date——

Q. What you mean by that, then, is structures or parts of the plant becoming obsolete because of their incapacity to perform the service that will be required of those parts when the conditions change?

A. Yes.

Q. In addition to the valuation that Mr. Alvord places upon the real estate and springs of this company, he also puts a valuation of $50,000 in round numbers upon these spring properties as a water right valuation. I wish you would state whether or not, in
393 your opinion, there is justified any addition to the valuations you have given for these properties in your valuation on this account. A. I feel that my figures have covered that value of the water as well as the land which was acquired in these several parcels. I don't feel that there is any addition to be made to my figures by such reasoning as Mr. Alvord follows in determining that amount of $50,000.

Q. Mr. Alvord has filed a statement giving his views of the proper distribution of the earnings of the applicant as between what he calls the public service and the service to private consumers, and I believe you have also treated that subject. I wish you would state what the result of your conclusions are along that line as compared with the conclusions Mr. Alvord comes to; I mean as to the percentage of the service which should be borne by private consumers and the percentage of the receipts of the company which should be borne by the public service.

A. Mr. Alvord has gone a little further than I have and apportioned operating expenses as well as property value, while I have apportioned only the property value as a basis for the division of the items of net return on value of property and depreciation and taxes. Those three items I would apportion, 27½ per cent to the public hydrant service and 72½ per cent to the private service. Now, those ratios or percentages are not applicable to the division or ap-
394 portionment of operating expenses.

Q. Now, what was that 27—That was the cost of the plant?

A. Cost of the plant.

Q. You apportioned that 27½ and 72½?

A. Yes. I have not dealt with the operating expenses at all.

Q. Well, what, in your judgment, would be a fair percentage of the receipts of the applicant that should be paid by the public serv-

ice and a fair percentage of the receipts of the applicant that should be paid by private consumers?

A. Well, without making a detailed study of the operating expenses and a classification of them, I could only venture a guess as to what the percentage of gross income which should be in hydrant rentals might be, but I think Mr. Alvord's percentage of 35 is not materially in error.

Q. You think, then, that about 35 per cent of the gross income of this company should come from the public service, and about 65 per cent from private consumers?

A. From my personal knowledge, that seems to be a reasonable percentage. It might not be just what I would arrive at after an analysis and study of the operating expenses.

Q. Yes. Of course, that is—Theoretically Mr. Alvord is correct?

A. Yes. It is based upon the relative costs of furnishing
395 these two kinds of service from two independent plants.

Q. And then turning the two plants into a composite plant and dividing the expenses of one between them in the proportion that each bears to the whole?

A. Exactly, yes.

Commissioner Northcott:

Q. It is true, isn't it, Mr. Miller, that a very small part of the operating expense should be charged against the fire service?

A. Yes, I think a smaller part of the operating expenses usually fall to the fire protection service, and that being the case, the ratio for fire protection service might be less than my percentage of the property.

Q. Have you made any calculation in general for towns of 15,000 inhabitants showing that percentage?

A. Several of them; quite a number of them; and I have set forth in my report a table not numbered—on a page not numbered—showing the hydrant rentals or the fire protection service charges established by the Railroad Commission of Wisconsin in water rate cases affecting utilities in cities of various sizes; and I think I am safe in saying that in all of those cases I have made the apportionments of property and in some of the cases have apportioned the operating expenses.

Q. But you don't show what percentage here?

A. No, I haven't those figures with me, but I show the former hydrant rentals and the hydrant rentals as fixed by the
396 commission.

Q. But you don't know what relation that bears to the whole?

A. No. And I also show the size of the city affected by this change in rates.

Q. Can you give us any information as to the percentage they bear to the total revenue of the company?

A. In cities of 15,000 inhabitants? I am afraid I could not venture any figures from memory which I could testify were correct.

Judge Ritz:

Q. Mr. Miller, assuming that the applicant is now receiving an adequate return upon the capital invested, what can you say as to the present distribution of this return between the public service and the private service?

A. It seems to me the public service is not bearing a fair proportion of the total cost of both services.

Q. Then assuming that the rates should be increased, it necessarily follows that before there should be any increase to the private consumers the public service should be increased until it reaches that fair proportion; that would be true, wouldn't it?

The Witness: I didn't quite follow that. Read it.

(Read.)

When you say assuming the rate should be increased, you mean——

Judge Ritz: Instead of rate, say, "assuming that the gross income should be increased." That is what I mean.

397 A. I would say yes.

Q. Of course, that is argumentative.

Is there anything else you think of that you want to explain, Mr. Miller?

(No answer.)

Commissioner Northcott:

Q. What is your total value as to the reproduction-new cost?

A. Well, before applying the reductions that I have mentioned here, it was $383,122.

Judge Sanders:

Q. Now, after applying the corrections what would it be, Mr. Miller?

A. Well, I have one correction to make yet. I haven't figured out the services.

Q. Excluding that, what would it be? You are working on that, are you? You will give us that information?

A. Yes.

Q. Suppose you wait till you get the information. Then you can put it all on the $383,000.

Commissioner Northcott:

Q. Well now, there is a big difference between you on the two items of laying mains and laying services under pavements, isn't there?

A. Yes, sir.

Q. Aside from those two items, what is the difference between your estimate and Mr. Alvord's.

Mr. Alvord: I have that tabulated, if you want it read into the record.

Commissioner Northcott: All right, sir.

398 Mr. Alvord: The greatest item between us is water sources, on which my estimate is, on which my estimate is $34,468 higher than Mr. Miller's. The second greatest difference is cutting through pavements over mains, on which I am $27,511 more than Mr. Miller. The third difference is in services, part for cutting and part for the correction he is going to make, on which I am $19,868 higher than Mr. Miller. The fourth greatest item is preliminary expenses, on which I am $13,455 higher than Mr. Miller. The fifth item is contingencies, on which I am $10,956 higher than Mr. Miller. The sixth item is engineering and superintendence, on which I am $6,894 higher than Mr. Miller. The seventh item is pipe line to the city from the gravity springs, on which I am $6,630 higher than Mr. Miller; and the 8th greatest is the pipe line from the Ada springs, on which I am $5,814 higher than Mr. Miller, subject to Mr. Miller's correction on the last two items. Ninth is the unusual excavation on the distribution system, on which I am $4,536 higher than Mr. Miller; and the tenth is laying cast iron mains, on which I am $4,040 higher than Mr. Miller; and the rest of the items are smaller than $3,000 apiece.

Cross-examination.

Mr. Fox:

Q. Mr. Miller, on your direct examination, when asked in regard to your experience, you stated at what different occasions you had made valuations. I wish you would please state what ex-
399 perience you have had in creating and erecting water plants similar to the one in Bluefield.

A. I haven't any similar to the one in Bluefield.

Q. Or in any water plants.

A. I haven't done anything more than draw plans and specifications for one or two small plants—village plants.

Q. Have you ever actively assisted in carrying through these plants from their incipiency to the time the plant was put into operation?

A. No.

Q. You stated in your direct examination in regard to several of the items that you had no data from which you could arrive at a conclusion except the application of your own judgment. Do I understand from that that in most of the items you were basing your judgment upon the actual cost at the time they were purchased?

A. Oh, no. I did not make myself clear when I made the statement that I had no data upon which to base my figures as to unit prices for that work. What I meant to say was that I had no actual costs of exactly similar work, recent or ancient; and I have to determine the unit prices which I used from a comparison with the costs which I know were obtained in somewhat different work. They were taking into account the differences in the nature of the

work, and all the differences and conditions that affected the difference in costs.

400 Q. Well, all of these items have to be arrived at by the application of judgment to the costs of purchasing and instituting these different items at this place, did they not?

A. Yes.

Q. We come to the first item, as tabulated in the inventories and in the valuations, which is preliminary cost. I believe you stated on direct examination that you could see no relation between this preliminary work and the cost of the plant. Now I may be misquoting you, but that was my understanding. I wish to ask you in that connection whether or not you believe it would be possible to construct a plant similar to this one without an exhaustive amount of preliminary work.

A. Well, I know of the construction of a great many water plants where the work included under that heading was practically negligible, and I did not see that the conditions here would necessitate the expenditure of nearly $15,000 before the determination of the question of whether the project would go ahead or not.

Q. Well, do you think it would be sound business judgment to invest almost $400,000 into a water plant without a thorough preliminary examination in regard to the quality of the water, the amount of difficulties that would be encountered in excavation, the purity and source of supply of the springs, and so forth?

401 A. Well, the cost of determination of the purity of the waters would be covered by $100, easily, by having analyses made of samples from them. I assume that it was common local knowledge that those springs existed up there at a high elevation above the city, and that a running of a line of levels from the city to those springs would establish the advisability of a direct gravity supply.

Q. I understand the reproduction-new-less-depreciation theory of arriving at value to mean the reconstruction as of today of the plant and the reconstruction today of the plant in question.

A. Yes, sir.

Q. Taking into consideration the fact that the present supply has proved inadequate, wouldn't this investigation cover all the available sources of supply, their analyses, and the amount for which they could be furnished, the cost of furnishing them, and so forth?

A. I do believe that the unknown conditions would have to be—should be investigated by any prudent investor; but I don't believe that an expenditure of $14,000, nearly $15,000, would be necessary to establish the prudence or the advisability of building an adequate water works and furnishing an adequate supply in a city this size and under the conditions existing here.

Q. Well, I don't understand the $15,000 of Mr. Alvord to include only engineering. That includes legal work too, and I will come to the legal phase of it in a minute. I am speaking now only

402 of the engineering operation which it would be necessary to go into before this plant could be instituted on the present scale.

A. Well, that item of mine doesn't contemplate very much legal expense; and it might be that I have made no adequate allowance for the legal expense included there. It didn't contemplate very much legal work of a preliminary nature before the project was started.

Q. Well, wasn't your estimate of $1,000 based on what it actually did cost?

A. No; I have no knowledge of what it actually did cost.

Q. And you still believe that this plant could be—all the preliminary work and engineering could be done for $1,000 to create a plant of the present size in the town of Bluefield?

A. Yes, sir.

Q. Mr. Miller, in those items which we stipulated before the commencing of this hearing, before we accepted the inventory, the total amount of the value of those differences would not be a great amount? Most of it is excavation and so forth, isn't it?

A. There is a considerable amount in that rock excavation at the Ada pumping station. I have not made any summary of the differences involved by those discrepancies.

Q. Can you approximate the difference in those items contained in that stipulation? Just roughly.

A. Oh, I think perhaps $3,000 might cover it nearly.

Q. You mean the difference in the value set by Mr. Alvord
403 and yourself on those items would amount to about $3,000?

A. Yes.

Q. Mr. Miller, in your report on the valuation, you excluded absolutely spring tract No. 20 in your estimation of present value?

A. Yes.

Q. Do you feel that that spring tract was purchased in the exercise of any bad faith?

A. No.

Q. Was it in violation of ordinary human discretion to have purchased this spring at the time it was purchased?

A. No.

Q. Well, Mr. Miller, taking into consideration the theory that we were reproducing this plant as of today, would it not be possible that in producing such a plant similar mistakes would be made at the present time in buying water rights which would be developed in the course of twenty years?

A. No. I think some mistakes are likely to be made in any case.

Q. Then, since we are taking the cost to reproduce the plant at the present time such as we now have, why is it that you exclude absolutely from your valuations purchases that were made in good faith in the past, which only later developments prove to have been worthless?

A. I have included those items in my cost of reproduction new, but they have depreciated to no present use or value in connection with the service.

Q. Then in fixing values for rate making purposes, if you
404 include depreciations of that nature, should you not include appreciations?

A. Yes, and I think I have.

Q. Then the proper way to arrive at the value would be to exclude depreciations and include appreciations.

A. No; I have included both.

Q. Then in depreciating entirely that spring you charge us with knowledge as of the date of the purchase which has been acquired by this company by its operation of this plant through long years of service?

A. What was that?

(Question read.)

A. I don't see that I do.

Q. Well, this spring was valuable at the time it was purchased, and was afterwards rendered invaluable by the city discharging sewage in its immediate vicinity?

A. Not spring No. 20.

Q. Which spring is it that is contaminated?

A. 22.

Q. Well, the same reason applies to both springs being depreciated, that they are both useless to the plant at present?

A. Yes, but the causes differ in the two cases.

Q. Then you would not depreciate 22 entirely in arriving at your value of the present plant?

A. I did do so because I believed the spring was not used or useful—not fit for use.

405 Q. Isn't there a possibility in the future of this spring becoming useful by the city arriving at some other method of disposing of their sewage?

A. Well, I haven't gone into the causes of pollution of that spring enough to know whether there is a possibility of its future use or not.

Q. Well, assuming that the city of Bluefield had polluted this spring by discharging sewage in that vicinity, would you still depreciate it?

A. I would consider it neither used nor useful until it was proved that its waters were pure; knowing that it had been condemned, I would consider it condemned for all time until proved that pollution had ceased to exist.

Q. Even when you take into consideration the fact that this spring was valuable at the time it was purchased, and was only rendered worthless by the act of the city, who are at this time contesting the application for raise of rates. Do you still feel that it should be depreciated?

A. Yes, as it is neither used nor useful, I don't see that it should be included in the value of the property used and useful.

Q. Then in what way would you recompense the company for the pollution of this spring?

A. Well, I don't know how—there might be different ways in which the company could be recompensed for that. If the city was liable—if the city was responsible for the pollution, I presume

406 it is responsible for damages.

Q. Mr. Miller, I believe you have depreciated entirely, or

to a great extent, the 99.36 acres of land upon which the old reservoir and dam for the impounding of the water from Ada springs was built. Is that correct?

A. Yes, sir. Yes, because I didn't see that it was used or useful in furnishing the services.

Q. If a filter plant was erected there for the filtration of water, and that dam and reservoir were placed in operation, wouldn't they be of value to the company?

A. It would then, of course.

Q. Well, then, hasn't this tract of land a potential value to the company?

A. It has, in the sense of—assuming that some future improvement may be made, and that difference made in the service, filtering water, adding to the supply. When those other improvements are made this will have a necessary part in that added value.

Q. Well, isn't the Ada spring itself located on this 99.36 acres?

A. I didn't so understand it. If it is then there is a portion of this land that should be included.

Q. Assuming, then, that the Ada spring is located on this tract of land, how would you change your estimate of the value of this 99.36 acres?

A. The map of the system indicated to me that the Ada
407 springs was not on that 99.36 acres, but the 99.36 acres was below, down stream, from the spring tract, and the—— Well, I have an item of spring tract No. 21, which is the Ada spring, which is separate from that 99.36 acres, a special parcel of land entered as spring tract No. 21 in the inventory.

Commissioner Northcott:

Q. What is the amount of land included under the Ada spring?

A. Spring tract No. 21, whatever its acreage is. There is two acres entered in the inventory for spring tract No. 21.

Judge Ritz:

Q. That is in Mr. Alvord's inventory?

A. Yes, sir; which is separate from that 99.36 acres.

Judge Sanders:

Q. Now then, assuming, Mr. Miller, that this spring is on the 99 acres, what portion of that 99 acres do you think that the company was justifiable in acquiring with this spring, and what would be the value of that portion of this tract?

A. I could not, with my present knowledge of the exact situation there, attempt to say just exactly how many acres of that 99.36 would be entitled to be considered as belonging to that spring. Most of the springs have only an acre to two acres in connection with them; and I should suppose that some such amount, possibly a little more, in this case, really belong in the used and useful property.

Q. Well, I believe you depreciated this tract of land?

A. Yes, I did not consider it used and useful.

Q. Now, as I say, assuming that this spring is on that
408 tract, in what way would that affect your figures on the depreciation?

A. It would restore a portion of that value which I have -liminated.

Q. Well, how much would that be? Can you give us the quantity of it, and the value?

A. The whole amount that I have included here for the 99.36 acres is $2,600, as cost of reproduction new. I don't consider that more than 5 per cent of the acreage would be likely to be necessary, although I couldn't say positively.

Judge Ritz: Might I ask a question right there?

Q. Mr. Miller, if the spring is on the 99-acre tract, what would become, then, of the item of $1,000 that you have allowed for the spring as being on another tract?

A. Well, if that was unnecessary for the protection of the spring against pollution, it would go out.

Q. Well, suppose it was necessary—the two-acre tract was necessary to protect the spring against pollution, would it be worth $1,000 if the spring wasn't on it?

A. I should think that that would merely have a land—an ordinary land value there.

Mr. Fox:

Q. Well, Mr. Miller, suppose that this 99.36 acres has a potential value to the company, should the company have credit for it in this valuation?

A. I don't believe that in order to do justice to the company that the city of Bluefield should pay rates on that value. The
409 company has an investment there, which it may succeed in getting out of it by sale of the property or such part of it as is not useful in the water works service.

Q. Then, in other words, Mr. Miller, if the company should believe that a piece of land would in the future be very valuable to them in furnishing water to the city, but which at the present time is not useful, they would not receive any credit for that value for rate making purposes until it had developed into a part of the plant? Is that correct?

A. I think that is the principle that has been followed by judicial bodies charged with rate-making powers.

Q. Assuming that the Henry Bailey farm could not be bought except as a whole, was the purchase of this farm a judicious expenditure, in your opinion?

A. Yes, but it does not follow from that that the entire value of the whole acreage is necessary to the service. The company might at any time dispose of any unneeded portions and get the cash out of it.

Q. They have not yet done so, have they?

A. Not to my knowledge.

Q. Do you know whether they have had an opportunity or doing so?

A. No, I do not.

Q. And since it was impossible to buy land to protect the spring without getting the whole farm, shouldn't that be included in the value of the water works when it is used for the protection
410 of the spring?

A. I don't believe that necessarily follows, because that might lead to absurdities, just as the application of the theory of cost-of-reproduction sometimes leads to absurdities, if strictly followed.

Q. Mr. Miller, I believe you stated that the greatest distance any material was carried in the construction of spring houses and basins around the springs was a thousand feet. Is that direct, or as the material was actually carried?

A. It is, as stated in the inventory.

Q. How is it stated in the inventory?

A. I have copied into my report, on page 11-*a*, the data given about the various springs, including statements of distances which the material was carried; and the spring where the material was said to have been carried a thousand feet was spring No. 2.

Judge Ritz:

Q. Whose inventory do you refer to?

A. Mr. Alvord's inventory. The statement appears on page 24 of the inventory, Mr. Alvord's inventory. All material had to be carried approximately a thousand feet up the mountain side.

Judge Sanders:

Q. The reason I asked you that question was yesterday Mr. Alvord or Mr. McCarthy stated that this material in some instances was carried a great deal further than this. I wish to arrive at what distance you took, whether it was a direct distance, as a bird flies, or
411 whether it was a distance as a man would walk going up the mountain.

A. I also made the statement that I had personally visited all of these springs and had looked over the statements in Mr. Alvord's inventory made in reference to them, and sized up for myself the correctness of these statements, including these statements of distance which material would have to be carried. In other words, I sized up the distances from the spring to which material might be hauled by wagon and estimated the remainder of the distance for which material would have to be carried.

Q. Mr. Miller, in reconstruction of a plant similar to this, would not the purchase of a Wyman pump be necessary?

A. Not necessarily a Wyman.

Q. Or a similar pump?

A. You might have to have some kind of a pump of that description, yes; and if it could be disposed of afterwards it could be done and the money gotten out of it.

Q. That was a necessary purchase in the construction of this plant, though, wasn't it?

A. I think so, but my information is that it hasn't been used in several years. It is not connected up with anything.

Q. Mr. Miller, under the decision of the Commission that was referred to yesterday, do you change your idea of value in regard to the service cocks which were originally put in at the cost of the consumer? That decision was that those are the property of the company, and that the cost of putting in was a fee charged by
412 the company to the consumer—service pipes?

A. No; I don't believe that there is any equity in compelling people to pay interest to others on investments of their own; and I believe, as the Supreme Court of Wisconsin stated in the case of Appleton Water Works company against the Railroad Commission, that what would cost nothing to reproduce under ordinary business methods is not to be necessarily included in an estimate of cost of reproduction. I thought I had a copy of that opinion here. And in that case, the question of service pipes paid for by consumers was in question, and the Supreme Court of Wisconsin upheld the Commission in excluding that item.

Q. It wouldn't be possible, would it, Mr. Miller, to reconstruct the present plant in Bluefield as of today without cutting through the pavements?

A. Oh, no; no, it would not; but the United States Supreme Court and a number of other legal authorities have held that that is not an element of value in rate making cases; so I didn't take the time to figure out what that element of value was.

Q. Well, leaving out of your consideration the decision of the Supreme Court, as a practical engineer do you believe that that should be considered in the cost of reproduction?

A. The property could not be reproduced exactly as it stands without cutting through the pavements overlying those pipe
413 lines; that is a fact; and the cost of cutting through and replacing those pavements would strictly be a part of the cost of reproduction; but, as explained in my report, my estimate contemplates the assumption—not only the assumption that there is no plant here and we are going to build one, but the assumption of the physical conditions which existed at the time the various parts of the property were put in. Would you care to have me read what I have?

(Reading:) "Cost of reproduction must mean the cost which will be necessarily incurred by a reasonably prudent and careful man, using ordinary, careful business methods, in reproducing a plant of equal efficiency. Anything which under the conduct of such a business would cost nothing to reproduce cannot logically be included. It is not denied that if the city or a new water company were to establish a new plant, the consumers could be required, as a condition of receiving water service, to do the work in question, and even furnish the pipe. Such a requirement is quite generally enforced at the present time in cities of this class. Conditions of life at the present time in such cities practically compel residents to accept water

service. Even in small cities the old fashioned well is either tabooed by public opinion or its use prohibited by health regulations. So it seems that there would be no question, but that it would be entirely practicable, and in fact the only reasonably prudent policy
414 for a new company to require consumers to lay their own service pipes."

Q. Mr. Miller, from your knowledge of the company's property, gathered from the inventory and your own personal examination of it and from your knowledge of the construction of the water works and from the information which you have been able to gather on the subject, what, in your opinion, was the cost of the applicant's water works?

A. I don't know what it was. I haven't a compilation of the costs. I have the costs of some features, and have had to estimate some other data on the cost of reproduction of other parts.

Q. I am only asking you for an opinion on that subject, not from any positive information.

Judge Ritz:

Q. Do you mean what it cost the company to build it at the time it was built?

Judge Sanders: What I mean is what the company has actually put into this plant as a plant; not in the operating expenses or repairs, but what they actually put into it as the proper primary cost of it.

A. Well, I couldn't do more than guess, and I wouldn't care to put any figures on the record that would be interpreted as being anything more than a guess, based upon insufficient knowledge. I have my records of the cost of reproduction and reproduction less depreciation; and beyond that I have no information to connect
415 that—to establish any relation between that figure and the actual total cost from beginning to end.

Judge Sanders:

Q. You have examined this inventory which was made by Mr. Luce, and you have also made a personal inspection of the property of the company. The inventory it is agreed is a correct inventory of the company's property, with the few exceptions noted in the stipulation. Couldn't you give us some estimate as to what you think this property cost the company?

A. I believe the cost would probably be less than I have figured as the cost of reproduction new.

Q. You think it would be less?

A. Because on many items I know that my allowance here is greater than the original cost.

Q. Well, I understand that, but I wanted to get your idea about that, if you could give me some idea about it. You figured on this as a reproduction proposition. Of course, in order to do that, you necessarily had to know what property was here. Now, knowing

what property is here, couldn't you give me some figures as to the cost of it?

A. No, I could not.

Q. It wouldn't be a material difference, however, between that and the figure that you have given that it would cost to reproduce it one way or the other?

A. There might be considerable difference.

Q. Well, why is it that you can give us the cost of the
416 reproduction of this plant and can't give us an approximation of the cost of the plant itself?

A. Because I don't know all of the original conditions under which the plant was built. I don't know how the history of wages of labor here throughout the time that this plant has been developed. I am informed that a great deal of it has been built through a period of more than ten years ago, when labor was getting considerably less than it is now.

Q. Well, assuming, then, that the cost of labor when this plant was constructed and when the property in connection with it—all the property in connection with it was acquired, and including all materials that went into it was the same that it is now, what would you say that it cost the company?

A. Oh, if the rates, *or* course, had always been the same as they are now, the cost would be, I think, substantially what I have estimated.

Q. The cost of the company would be what you have estimated to be the cost of reproduction?

A. Yes.

Q. Now, I believe you have stated, and it so appears in your report, that the cost of reproduction new is $412,991?

A. Yes.

Q. And that the cost of reproduction new less depreciation is $383,112?

A. Yes, sir.

Q. And that is subject to the corrections which you have already made?

A. Yes, sir.

417 Q. Will you please, then, give me the amount of the corrections which you have already spoken with reference to and then when you have made these corrections give me the aggregate amount of the cost of reproduction less depreciation?

Judge Ritz: I can give you the ones he has already given. $2,808, $277, and $1,600; $4,685, those amount to. That doesn't include the addition he is going to make for service pipes.

Judge Sanders:

Q. The corrections, then, so far that you have made amount to $4,685, and that amount doesn't include the correction that you propose to make in regard to the service pipes installed by the company?

A. No, nor does it include the proportion of the amount of overhead expenses.

Q. Now, then, these two items that you included, you will please furnish them to the stenographer and let him put it into the record.
A. Yes, sir.

Judge Ritz:

Q. What is that, the proportion of the amount of overhead expenses?
A. That is those items of engineering and superintendence and so forth which is ordinarily referred to as overhead.
Q. What you mean is, it is the percentage on these items of corrections?
Commissioner Northcott: On these corrections.

Judge Sanders:

418 Q. Then I will ask you this question, after you have furnished all of the corrections which you propose to make, including the ones which you have already made, you will please give us the total amount of reproduction new less depreciation.
A. Yes, sir.

Mr. Fox:

Q. Mr. Miller, we very frankly admit that we forgot to put a couple of things in our inventory, and the two things are the railroad siding at Ada and a water map in the office down here; and in making your comparison with the inventory, if you happen to notice those two discrepancies, I would like for you to place a value on them as near as you can at the present time.
A. I don't know about the map. I do know about the siding. I meant to make note of it; I knew that at the time I was going over the property. I meant to include it in the valuation. I called Mr. McCarthy's attention to it today. I didn't include it because it had slipped my mind. I hadn't made a written note of it, and my mental note of it had left me. It is customary for railroad companies to charge the user for the cost of installing a siding, and while the siding does not remain the property of the user, it is an expense to him. It was quite probably an expense to this company to get that siding—cash outlay—and ought to be included. As I said, I meant to include it. I don't know the exact length of it, the weight of the rails, or the amount of grading that was
419 necessary there; but Mr. McCarthy tells me that there is just space for two cars in the clear of the main track. I should think that ought to fairly represent a cost of between four and five hundred dollars, probably.
Q. Can you place a value on the water map?
A. No, I don't know—I don't know anything about that water map. Is that a wall map?
Mr. McCarthy: No, it is a folio; it is an atlas.
The Witness: One of these insurance atlases, 50 foot scale to the inch?

Mr. McCarthy: No. About fifty pages in it.
The Witness: The pipe lines all entered into it?
Mr. McCarthy: Yes.
The Witness: Covers only the city; not the entire system?
Mr. McCarthy: No, the entire system.
The Witness: Your spring pipes and all?
Mr. McCarthy: Our spring pipes and all. Then a map showing just the mains alone.
The Witness: Well, I don't know about that. My impression is those books cost $25 apiece, isn't it?
Mr. McCarthy: Well, I couldn't say what these covers cost.
The Witness: The maps are printed and bound?
Mr. McCarthy: Yes.
The Witness: I am familiar with those insurance atlases, with 50-foot scale. I don't know how many pages this has, or how much drafting would be done but there would be the cost of the books and the cost of the drafting, anyway. The drafting involved
420 in showing the pipe lines and other properties of the company. I don't know; I haven't seen those atlases. But I should presume that would represent at least $100, if the books cost $25, and that is only my vague recollection of figures that I haven't seen for quite a while—some years.

Judge Sanders:

Q. If it cost the company $2,500, you wouldn't say that would be too much, would you, not having made an examination of it?
A. Oh, if it cost that I presume it is a fair price. It doesn't seem to me it ought to be much more than $100, unless my recollection as to the purchase price of the printed books is very much in error.
Mr. Fox: That is all.

Commissioner Northcott:

Q. Mr. Miller, I want to ask you a question, please. What, in your opinion, is the true measure of value of the property used in the public service for rate-making purposes?
A. I don't believe that there is only one measure of value? I believe that if the original cost can be ascertained, and if the property is not of very ancient origin, that evidence is of value in determining the value of the property today. Many times, however, that evidence is not available, and reproduction cost estimates are the only measure of value applicable; but they are also mere evidences of value—these estimates of reprduction cost less depreciation, I mean, are mere evidences of value, and they are many times the only evidence available.
Q. Would you take into consideration, in fixing the value for rate making purposes, the earning capacity of the property under normal conditions?
A. Yes, the value of the service to the users of the service must be taken into account.
Q. If the town of Bluefield should fall upon hard times, and in the course of a few years become reduced to a city of the population

of 2,500 or 3,000 people, the reproduction new value of this plant less depreciation would not be much of a criterion, would it?

A. Not at all. I have known cases of that kind. The Ashland case, in Wisconsin, is a notable example of a city that suffered a decline in the population and the general business conditions. The water works there represents the highest per capita valuation of any plant in the state, about double the average per capita valuation, and is far more than adequate for the city as it is today, or as it has been for several years; and the company—that water works—has been before the Wisconsin commission three times in rate cases, and is now—the company has recently applied to the commission again, making a fourth appearance for a review of its rates. The last order of the commission was on a re-hearing of a previous order, in which
422 the commission granted a very substantial increase in the fire protection charge, and fixed rates which still yielded the company less than 6 per cent return on a conservative valuation of the property; and upon this re-hearing and the showing and pleadings made by the city of the hard times being suffered up there—they had suffered for several years—the commission lowered the fire protection service charge and I think the domestic service rates, so as to make still less than was allowed under the previous order, which was then less than 6 per cent net return.

Q. Then, in your opinion, there are a number of things which should be given weight in determining the rate-making value of a public utility plant?

A. Yes, sir.

Q. In your opinion, Mr. Miller, should there be, or could there be, two values, one for rate-making purposes, say, and the other for taxation purposes?

A. Well, that will depend, I think, perhaps on the laws in some states, or the custom in regard to taxation. I don't believe that the utility should be taxed on 100 per cent of its value when other property is taxed upon a lesser proportion.

Q. Predicating your opinion upon a law which says that all property shall be taxed at its fair and actual value, could there, or should there, be two values, one for taxation and one for rate-making purposes?

A. Theoretically, there should not, but practically, I think, there should, for this reason, that a law of that kind, like a lot of
423 other laws, is more or less of a dead letter. The assessors do not usually, at least in Wisconsin, get property on the assessment books at full value, although we have a law in Wisconsin which says that the property shall be assessed at full value; and the tax commission in our state has for a number of years gathered statistics in every assessment district as to the proportion of real value which is shown by the tax rolls, and those ratios did, a few years ago, range down to 50 per cent in some assessment districts, and the tax authorities have been quite energetic in pressing the assessors in those districts particularly to get those ratios raised. There is the law which prescribes the property shall be assessed at full value,

but it is not; it is not done; and where other property is assessed at less than 100 per cent I think utilities should be treated alike.

Commissioner Northcott: That is all.

(Witness stands aside.)

The respondent, the city of bluefield, here rested its case.

Thereupon, the applicant, to further maintain the issues on its behalf, introduced the following evidence in rebuttal, to wit:

424 WILLIAM MCCARTHY, recalled, tetified as follows:

Direct examination:

Mr. Fox:

Q. Mr. McCarthy, I would like for you to show what the value of that siding—railroad siding at Ada—which was omitted from the inventory of Mr. Alvord, and also the water map which was omitted from the inventory—what the value of those two things is.

A. I haven't had an opportunity to value this siding, and I don't know the exact length of it. Mr. Miller very kindly called my attention to it at noon today, or the matter wouldn't have come up. I assume, as the siding will hold two cars, that it will be eighty feet long from the clearance point to the end. It would no doubt be forty feet from the clearance point to the point of the frog, and about eighty feet from the point of the frog to the point of the switch. This would make an even 200 feet, and I would estimate the value of the siding at about $2 a foot, making $400.

Q. Please state the value of the water map now as near as you can.

A. I couldn't state exactly the cost of the water map. It cost us more than what it is actually worth now, but I would place its present worth at $2,500.

Cross-examination.

Judge Ritz:

Q. Mr. McCarthy, this siding that you say is worth $400 was put in by the water company on the railroad company's
425 right of way and at the expense of the water company. That is true, isn't it?

A. Yes, sir, that is true.

Q. And it belongs to the railroad company, doesn't it?

A. Well, I suppose it belongs to the railroad company; under the rulings of the Interstate Commerce Commission, perhaps by our laws, but we feel a personal interest in the matter, inasmuch as we paid for it.

Q. As a matter of fact, your contract with the railroad company

provides that it is the property of the railroad company after you put it in there?

A. I don't know, I am sure. I have read the contract, I believe. I don't know whether that contract carries that stipulation or not. I was with the railroad company when that contract was adopted, and it occurs to me that it was possibly after this date that that clause in the contract was included.

Q. Well, wasn't that clause in the contract of the company used 26 years ago?

A. Not that I know of. I can recall many of the contracts, all right, and have put in many sidings under them, but I don't recall——

Commissioner Northcott: Well, gentlemen, isn't it immaterial, for the purposes of this case?

Judge Ritz: Yes, that is not what I am getting at at all.

Q. Mr. McCarthy, I wish you would state why, if the water company should be credited in its assets or in the value of its plant with this siding that was put in at its expense on the rail-
426 road company's right of way, it should also be credited in the value of its plant with these services pipes which were put in by other people at the expense of other people. What reason have you for giving the water company credit for both of these things?

A. Well, I believe, under the reproduction method, a matter that is useful to the conduct of the company's business is included, and that certainly would be one item of it.

Q. Didn't you on yesterday state that the reason you included these service pipes in the value of the company's plant was because in building a railroad these sidings that are built by other people become part of the railroad company's property?

A. I said so.

Q. And taking a like reasoning, that then those service pipes ought to become a part of the water company's property? Is that so?

A. Yes, sir.

Q. As a matter of fact, this siding, taking your reasoning, is not a part of the water company's plant at all, is it?

A. Legally, I suppose, it is not. However, the water company has got the $400 in it.

Q. And it hasn't got these several thousand dollars in the services, has it?

A. That is true.

Q. Now, about this water map, who made this water map?

A. This map was made by a man named William H. Ford, a civil engineer in Philadelphia.

427 Q. He was an employe of the company, was he?

A. Yes, sir.

Q. And paid a regular salary?

A. No, sir, I think not.

Q. He wasn't one of the regular employes that was employed by

the company and paid a regular salary out of the expenses of the company?

A. No, sir.

Q. Is this map charged in the plant or in the items of expense?

A. I don't know how it is charged in the items of expense connected with the company. I suppose it is charged to the map as a part of the water works system.

Judge Ritz: That is all.

Redirect examination:

Mr. Fox:

Q. Mr. McCarthy, the expenditure for this siding was a necessary expenditure of the water company, and was so paid for by it, was it?

A. It was.

Judge Sanders:

Q. And would have to be provided for in the reproduction of the plant?

A. It would.

Q. Mr. McCarthy, you heard the evidence of Mr. Triol, who testified in this case, did you?

A. I did.

Q. And you heard him give the operating expenses of the company for quite a number of years? You heard his evidence in that respect?

A. Yes, I heard it. I don't know that I can recall what the figures were.

Q. Well, I don't ask you to recall, but I will ask you to state whether the items of expense referred to by him were reason-
428 able and necessary items of expense of the company.

A. Yes, sir, they are reasonable items.

Commissioner Northcott:

Q. Mr. McCarthy, when did you come with the company?

A. I came with the company in 1903.

Q. Were the duties of the president then about the same as they are now?

A. So far as I know; yes.

Q. There has been no change, so far as you know, in his duties or the work performed by him for the company?

A. No change that I know of.

Q. When was it he began to be paid a salary?

A. Well, I suppose he was always paid a salary. However, I don't know anything about that.

Q. You heard Mr. Triol's evidence yesterday?

A. Yes.

Q. Did you notice the expenses for the home office salaries in-

creased along about 1913, and ran up to about $4,800 from a much smaller sum?

A. Yes.

Q. What was the cause of that increase?

A. I couldn't say, I am sure.

Q. Do you know of any increase in duties performed in the home office that would justify that?

A. Well, I can't say about that.

Q. I say, do you know of any?

A. No, I don't know what would justify it.

(Witness stands aside.)

429 JOHN W. ALVORD, recalled on behalf of the applicant, testified a follows:

Direct examination:

Mr. Fox:

Q. Mr. Alvord, yesterday in the cross-examination of Mr. McCarthy the question was asked whether or not you had miscalculated the station economy at the plant at Ada in comparison with the rest of your new plant at Bluestone. I would like for you to explain that.

A. The testimony appeared to show that our analysis of the value of the springs was based on incorrect determination of the station economy at Ada, and I don't believe that that is quite true, and would explain that the analysis is a relative one, the same station economy being adopted at the Bluestone plant that is adopted at the Ada plant, and the differences only being used; and in this connection I think it might be well to note that the cost of water per million gallons is not here the whole cost of the water, because items which were common to both plants were omitted for convenience.

A further explanation is probably due, due to the fact that the report itself is not—is not possibly as clear as it might have been made, owing to a misprint. "The cost of pumping at the present plant (comma) at Ada (period)" is intended not only to represent the cost of pumping at the Ada plant itself, but also the supplementary pumping that has been done all during the dry
430 weather from the Beaver Falls, and this has been consolidated into the station duty at Ada so as to represent the combined pumping efficiency at those two plants. My first figures separated these two, and then I thought for simplicity I would combine them, and some of the printing was not changed so as to make that as clear as it might have been, and I don't wonder that it led to some misconceptions. Now, the real effect, [illegible], is not as would have been represented by the cross-examination of Mr. McCarthy.

I would like to further supplement that analysis by some other figures and reasoning which are not included in this analysis. Possibly I was too anxious to make it brief and short, and thereby sacrificed to some extent its effectiveness; but I have computed the cost

of water based on the station economy of each station by itself, from each of the four sources, including the proposed Bluestone supply, and including all items such as stations, supplies, maintenance, repairs, and salaries, which in the two cases in the analysis were common; and I have based these on the minimum flow in each case. As soon as we have the average flow it must be remembered that the springs will supplement the pumping and reduce the economy, and therefore the gravity springs and the higher supplies, the supplies that are pumped less, increase in value. Therefore, this is the most rigid, conservative position which can be possibly taken. The
431 gravity springs, for instance, including all of the interest, depreciation, operating, and maintenance, cost per million gallons, delivered into the tank, only $20.30. The Ada springs taken alone now, and based on the minimum quantity pumped, of 430,000 gallons a day, and including all of the station salaries, depreciation, maintenance, interest on the investment of the plant and pipe line up to the tanks, cost per million gallons, $127. The Beaver Pond station, as near as I can get at it—I haven't as accurate data on that, from the short time I had, as I had on the others, but I think I am approximately correct—taken in the same way, from the old station, cost $92 per million gallons; while the proposed Bluestone supply, taken on my estimates and on the basis that 2,000,000 gallons a day is delivered, would cost $41.15 per million gallons. Therefore, taken in this way, it would be shown that the gravity springs supply water at at least half the cost per million gallons which the proposed Bluestone supply would supply them, which is the next nearest source of supply. Now, all of this is based on the minimum flow. If we had the data—which we haven't got, unfortunately—to show the amount of flow used and useful during the year, the value of the gravity springs would be very much enhanced, unquestionably. We have taken here the time when the gravity springs flow the least and therefore are at their period of least value.

Now, I have summarized that by four conclusions in which
432 I have summarized all of these considerations which induced me to adopt the sum of $50,000 for all the springs, as follows:

First. The Bluestone supply, as proposed, is not an unlimited supply; it cannot be developed greater than the amount we fix in advance for the project, because we must determine the cost involved in our impounding reservoir based on the amount of water which we will produce; if we develop 2,000,000 by an impounding reservoir sufficient for that purpose, then we will only have 2,000,000 gallons. We can't increase that supply without greatly increasing our investment.

Second. The springs have been measured in terms of the next nearest supply at the time of their least flow. If we could measure their average useful flow we would find greater value established for the gravity springs.

Third. It would be impossible to repurchase the springs for any reasonable value at this time, owing to the general impression that they have unlimited value. I presume, if the commission desired to

be convinced of that fact, that the company could produce any number of witnesses who would express views on that line.

Fourth. On any measure, the gravity springs have an advantage. Their total cost per million gallons delivered is half that of the next most available supply.

I really think that all of those thinks influenced me to fix
433 that value. I feel quite sure that those springs have an excess value over their cost of development; and I susually test out a conviction of that kind by changing places in my mind with myself and considering if the city would be willing to take this plant without those springs—leave the company the springs and their development —and have it look elsewhere for its supply, I am quite sure, under those circumstances, the city would be willing to pay at least $40,000 or $50,000 plus the development of the springs to have the plant remain intact as it is.

Q. Mr. Alvord, you have heard Mr. Miller's explanation of the differences in estimates. I wish you would please explain what you consider the fundamental difference in the values arrived at between you two. What was the fundamental reason of the difference in the values?

A. "I listened with a great deal of interest to Mr. Miller's exposition of his methods and researches this morning; and I fully recognize Mr. Miller's great conscientiousness in those matters; but I was struck with the fact that he approaches the subject fundamentally differently from what I do, and that that fundamental difference really accounts for the very larger part of our different conclusions as to reproduction cost. Mr. Miller seems always to me— and I am sure that he won't mind this friendly exposition—to be seeking the cost under past conditions and the past cost, and
434 then applying that to reproduction cost at the present time, rather than facing the present problem at the first part of his investigation; and he, I think unconsciously to himself, slips from past cost into rebuilding cost, and then from rebuilding cost back into past cost, without really realizing that he does so. Take, for instance, his analysis of the cost of pipe laying. He immediately seeks the cost that the company has incurred under past conditions, under piece meal conditions, as his first line of investigation; and, failing in that, he seeks other piece-meal and past conditions, and then he applies that to what he calls reproduction cost. I would differ in that matter, by confirming at once what would happen in this city were I to rebuild this whole distribution system in one season. Now, I wouldn't think about the past cost at first at all, unless I failed to find what I considered reasons for determining the cost under a totally new procedure. In the first place, under that condition my pipe would come in by carload lots and I would gain probably some on the purchase of the materials In the second place, I would undoubtedly corner the labor market here for expert water works construction labor, and we would have to import labor, and we would have probably to pay more for labor, and we would have probably inefficient labor; and as I conceive it, we would pay a larger sum per

unit to push that all through and get it completed in one sea-
435 son than has been the case with the actual cost of this plant, etc."; and my estimates, frankly, are higher—I believe them to be higher; they are intended to be higher—for that reason than the actual unit costs in laying pipe here in the recent past with a small gang of well trained company employes, thoroughly familiar with their work, and operating at the best season of the year and the best weather that they can pick, and with all the advantages of long familiarity. That tendency of mind is not uncommon, and it has been one of the common ways in which commission staffs have been trained, and from it arises this very mix-up on the paving question. Easily and naturally the mind slips back to the past, without realizing we are confronting the future, and logically and strictly must account only for the future in this rebuilding, and we come up against this paving proposition. Mr. Miller frankly and honestly says that we can't reproduce the plant without cutting through the pavements, but when he comes to argue he goes back to past cost. The cutting through pavements is undoubtedly an unearned increment and appreciation—something that has come to this company by reason of the fact that the town has improved—but we have no right to cut that out unless we cut out depreciations. If we are going to talk about depreciations on one side and not the appreciations on the other, then we are not telling the whole story; and just the minute

that your mind slips back into past cost and past conditions,
436 you are cutting out appreciations, unconsciously largely to yourself. And it is those very appreciations that we ought to have on the one hand, if we frankly and thoroughly deduct the depreciations on the other. Sometimes they balance one way; sometimes they balance the other way. I have known cases where the cost of pipe in the past had been so great that it greatly offset the cutting through pavements, and yet the commission cut out the cutting of pavements and neglected to consider that the past cost of the pipe should be considered too if they went back into the past at all; and my theory—my whole argument—is that the past cost is an investigation by itself, and that when we are reproducing your mind should not be permitted to slip back into past conditions at all, because then we do the plant an injustice by cutting out appreciations which should be all included, if we are going to deduct depreciations.

I trust that what I say will be taken in good part; I am sure it is meant to be kindly, and merely my point of view—my opinion—and a fundamental principle for which I am struggling these days very hard, because I think I see there the ruts of a great deal of confusion and great deal of trouble; that half of our trouble—half of our confusion—in this appraisal matter would be eliminated if everyone should see distinctly that when we are dealing with

reproduction cost we should deal with the present and the
437 future, and when we are dealing with past cost we have entirely a different line of reasoning and logic to govern us.

Q. Then, Mr. Alvord, do you believe that service pipes should be included in the valuation as appreciation?

A. No, not under all circumstances. When I come to the ques-

tion of services I reason just as I would reason with reference to that question of the siding. I think the logic is just the same; I am rather glad to illustrate it just that way. With reproduction strictly of this plant, we would have to face the cost of again paying the railroad company to build that siding on their property to become their own property. That is, taking it for granted that the usual procedure governs, that would become a legitimate part of the cost, and should be added to our reproduction.

Now, take the question of services, if we have no law or regulation now requiring the company to build all of the services, we could, on a reproduction, just as legitimately conclude that we can raise from the consumer whatever fee or whatever payment he has been accustomed to making on those services as a deduction from our reproduction cost, as has always happened; and where I find a large amount of services now—and I consider that the Knoxville decision re-uires me to include those as the property of the company, just as this siding is actually the property of the railroad company,
438 I still go ahead and I say on my reproduction I shall be able to get from the property owner a contribution to the cost of my property, which I will deduct from the full value of those services. Of course, that is complicated a little by existing law or rulings of the commission. If the ruling at the present time is that the company must build those services and must pay for them, then we must consider, I suppose, strictly on a reproduction, that we can't hope to make the property owner contribute. But I think that illustrates the duty of hanging to strict logic on this reproduction cost. You will always find, if you reason it out, that it will have sound reasoning that the reproduction will include all the appreciations frankly, and that when you tell the whole story, after getting all those appreciations, we will deduct all the depreciations, and we have got down fairly to the level of a reproduction measure, providing a reproduction measure is found, through all other tests, to be a good measure in the particular case in hand.

Mr. Fox: That is all.

Cross-examination.

Judge Ritz:

Q. Then, Mr. Alvord, in making these calculations you refuse to be taught anything by the facts of history?

A. When I am reproducing I make the past history a blank, and except so far as my experience and except so far as recent past costs throw light on present cost of reproduction; but I always go
439 through a historical investigation wherever I think it has any value or is desired, and from that historical cost nothing should be taken for depreciation unless you had appreciation. The same rule holds good there. I notice, for instance, that in the book cost presented here in Mr. Triol's evidence, that he has taken off depreciation from the book cost. He shouldn't take depreciation from the book cost unless he adds appreciation, because taking off

the depreciation is an endeavor to bring the past cost down to the present value, and you don't tell the whole story unless you take into account the appreciation as well as the depreciation.

Q. I understand that, but I understood from your argument—and it was a very good argument—that you didn't want to know anything about the past history of a plant when you came to fix the present value of it.

A. Why, I could come here today and not know a thing about this past history and make you a reproduction estimate of this plant.

Q. And you could do that a good deal better than if you had the past history?

A. No. The past history is always interesting, but it is not necessary, and it leads you into unconscious injustice sometimes, especially if your mind is not braced to the strict logic of a reproduction estimate.

Q. Don't you think if you wanted to reproduce a certain
440 structure, for instance, this building, that it would be of some service to you to know what it cost to construct it?

A. Why, certainly, if that is recent past cost; but an engineer's business is to build new things and know what new things will cost. That is what he is doing all the time. His whole life has been devoted to finding what it will cost to build something new under the conditions that are given.

Q. But this is to reconstruct something old.

A. But I am going to reconstruct it as though I were going to rebuild it all today.

Q. You are going to reconstruct a counterpart of what is here now?

A. Yes, sir.

Q. And notwithstanding that you are going to do that, you say it would be a detriment to know what it cost at first?

A. I don't say it would be a detriment. I say if my mind is not clear on the fundamental conception of what I am going to do, if I have that unconscious tendency to slip back into past cost at times when it appeals to me, it would be better if I didn't know what the past history had been.

Q. You would come nearer finding out what it would take to construct the house by not knowing what it cost?

A. Yes, with a man that really knows his business.

Q. And you believe that an architect would know better what it would take to construct the house before he builds it than after?

441 A. If you talk about architects, I drop out. Architects are not, as a class, held down as engineers are to their estimates.

Now, if you will permit me to say one more thing, I think I can make it perfectly clear. The tendency to estimate a plant under past conditions and at present day prices produces something which is practically a fairy tale—it is an illusion. We can't humanly

build works under past conditions at present day prices. If I could do such a thing as that I would be a millionaire; I would be in demand all over the country. That is what everybody would like to do, would be to build something under past conditions, under conditions that were easier than they are now; and when we unconsciously fall into the habit of estimating present prices from past conditions, we are doing something that is not humanly possible; it is an illusion; and we mustn't measure these utilities by illusions.

Q. You say architects are not reliable——

A. I never came across one that was——

Q. (Continuing:) And that their estimates on present costs are not to be relied upon. How about the contractor who bids on doing the work?

A. Contractors will vary a hundred per cent in their bidding.

Q. Then they are all unreliable except engineers?

A. I think engineers make more of a study and are more
442 reliable in their estimates, especially when they have spent a lifetime in one specialty, than either a contractor or an architect. That is why it is necessary to have long experience in these things. That is why you can't hope to get the results from these staffs of the commissions that you will get from men who have spent a life time just in doing that one thing.

Q. Now, I understand the sum of your evidence to be, Mr. Alvord, the only way to get an absolutely correct idea of what it would cost to do a thing is to have an engineer's estimate of the cost before it is even done, or before anything like it has ever been built?

A. That is what all business men do.

Q. And that that sort of an estimate is much more reliable as a basis of construction than the actual cost of a similar structure?

A. If it is made by an experienced man, yes. To illustrate that, the cost of a structure very often represents losses on the part of the contractor, especially incompetent contractors. Those losses are just as much a part of the cost of that property as the rest of its——

Q. Certainly; and when I say cost of it, I mean the actual money that went into it; not the money that was paid to the contractor at all.

A. Yes. If you have the actual cost of a property, and you have all of that cost. And the investigation of the past cost is just as much of a careful reasoning process as reproduction cost, es-
443 pecially recent cost.

Q. What do you mean by "recent cost"?

A. I mean done so close to the time of your valuation that there has been practically no change in the conditions or prices and labor and general conditions of the money market, and the like.

Q. Well, you mean a year or two years or three years?

A. Yes, in the case of a plant like this within five or six or seven years. If this plant had all been built within seven years, and we had an accurate book account of that whole transaction, and we had a careful analysis of the book account to see that none of the costs which were not repaid in cash were omitted from the book account, there could be no better evidence than that of the value of this plant

today, providing its cost, either reproduction or past, represented value.

Q. Then in so far as Mr. Miller has taken into reproduction past costs within the past seven years, he is not subject to criticism?

A. Well, no, sir.

Q. But when he goes back of seven years his testimony should be criticized?

A. Well, don't say exactly seven years; say comparatively recent cost.

Q. Yes, but it is hard for us to determine how far Mr. Miller is justified in going back unless you say what you mean by "comparatively recent cost."

A. Well, he must in his mind, as I have in mine, only use
444 that by analyzing whether there was any change in those conditions. In other words, he puts himself in precisely the state of mind that he would if he were engineer and charged by the Bluefield Water company with building this plant anew.

Q. Now, suppose we knew that a structure had been constructed ten years ago, and it could be shown that it was economically constructed, and there went into that structure $10,000; that at that time the rate for money was 6 per cent; that at that time the price for such labor as went into that construction was $6; that at that time the price of that material that went into that building was $5 for a unit; that today the price of money was six per cent; that today the price of such labor as would go into that building was $2, and that today the price of that building was $10 per unit, and we knew the number of units of labor that went into it and the number of units of material, couldn't you very easily find from the cost of that ten years ago the cost of it today?

A. That would be so if that condition exists. Such a condition as you outline has never, in my recollection, been in existence.

Q. But if it did exist, I say, wouldn't that furnish the very best index of the cost of the building?

A. Yes, but it never does exist. There never is a time anywhere when those conditions remain absolutely stable.

Q. My illustration didn't keep them stable.

445 A. So far as your illustration goes it is all right.

Q. When you know what the illustration is it is all right; it is easy to change from one condition to the other?

A. Your illustration sounds entirely foolish to me, because it never happened. There never was such a case.

Q. There never was a case where labor cost twice as much at one time as another?

A. There never was a case where labor remained exactly the same ten years.

Q. Oh, no, they are the conditions exactly.

Commissioner Northcott: He doubled the unit price.

The Witness: Even that would be almost impossible.

Judge Ritz:

Q. If it is impossible for them to remain the same, and impossible to change, what becomes of the conditions?

A. Conditions are always in a state of very wide flux.

Q. But they are always somewhere, aren't they?

A. But they are always changing. It is very hard to know what they all were ten years ago.

Q. If you have the cost of labor, what you actually paid for labor ten years ago, you know what they were then?

A. No, I don't think I do.

Q. As a matter of fact, it is a heap easier to tell what conditions were in the past than to tell what they will be in the future?

A. No; it is just as difficult to tell what they were in the
446 past as to tell what they will be in the near future.

Q. Then history affords us no light?

A. The reason is you have no means of checking. The very advantage of the reproduction method is that you are dealing with things that are in existence today, and everybody can go to it and check them. If you would tell me what conditions were ten years ago in this town I haven't the least chance in the world of going out and checking more than a small fraction of them, and then I wouldn't be certain that I had gotten reliable information. That is the trouble with all this past cost; you don't know the conditions. Today is the best time to know all the conditions and all the surroundings and check them.

Q. Then why, if these things can be definitely and certainly determined as of today, should experts ever differ as to the cost of anything at the present time?

A. Because there are different kinds of experts, just as there are different kinds of lawyers.

Q. The reason is because one man checks it differently from another and arrives at a different conclusion?

A. Well, it is astonishing how near engineers get together when they get all the same facts before them. When they get all the same facts before them, their estimates on properties don't vary five per cent, or three per cent. One of the advantages of putting the engineers on each side together is not so much to get their opin-
447 ions together as to get their facts together, to be sure that they are talking about the same thing, the same property, the same amount of property, and the same conditions under which it is to be reproduced. If you could guarantee that the engineers on both sides with equal experience had those same facts before them, you wouldn't find wide differences of opinion.

Q. You wouldn't find any differences at all, would you?

A. Oh, yes; value is not a mathematical proposition. Estimating is more or less a matter of opinion. It is an expression of judgment based on experience and knowledge of the facts; and I am very suspicious if it agrees too closely.

Q. And any determination of the cost of a structure at this time based upon estimates is bound to be more or less subject to change,

and that is demonstrated by the fact that you haven't sufficient reliance on your own estimate to put it in here without allowing 5 per cent contingencies?

A. Yes, because I suspect that I have forgotten certain things, just as I find that the railroad siding was forgotten; and there are unquestionably other things there which, though they have gone into this property, haven't been called to the attention of the man who made this inventory.

(Witness stands aside.)

448 NOTE.—After the conclusion of the foregoing hearing, the witness Walter E. Miller, complying with requests made of him in the evidence, made the following statement to the shorthand reporter in order that the same might be incorporated in this transcript:

"My calculation of the additions to be made to my estimates of cost of reproduction new and cost new less depreciation for Item #44, "Services & Fittings," which additions are necessitated by a misunderstanding on my part formerly, as to what work of that kind the company had done at its own expense, are as follows:

"Cost of reproduction new	$4,338
Cost new less depreciation	3,187

"These and the other four corrections, together with their proportionate amounts of overhead or general expenses, namely, 13.5%, make the total additions to my estimates,

"Cost new	$11,243
Do., less deprec'n	9,617"

NOTE.—Both the Applicant and the Respondent at this point announced that they had no further evidence to take at this time, but that they expected to introduce additional evidence at some later date to be hereafter fixed.

449 I, Charles V. Price, a Shorthand Reporter, do hereby certify that the foregoing is a true and correct transcript of the evidence and all of the evidence introduced before the Public Service Commission on the hearing of the case of Bluefield Water Works and Improvement Company v. The City of Bluefield, at Bluefield, West Virginia, on July 24-27, 1916, as reported by me in shorthand, with the exception of the exhibits therewith filed, and that said exhibits are hereto appended.

Given under my hand this the 16th day of August, 1916.

CHARLES V. PRICE,
Shorthand Reporter.

449a *Inventory of the Properties of the Bluefield Water Works & Improvement Company, Bluefield, West Virginia.*

January 1, 1915.

Alvord & Burdick, Engineers, Chicago.

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453 *Introduction.*

This inventory is a detailed statement of the properties of the Bluefield Water Works and Improvement Company at Bluefield, West Virginia, as on January 1st, 1915.

The General scheme of this inventory is to arrange the items according to the order of construction which would be followed were the plant to be reconstructed at the present time. Some slight deviations from this general scheme are made in order to group all like parts of the property together, but in general this idea is followed in the following statement.

454 *General Statistics.*

Bluefield Water Works & Improvement Company.

(1) Population Served: (January 1, 1915) 14,500.

(2) Water Supply:

(*a*) Gravity Supply from the Gravity Springs to Bland Street Tank.

(*b*) Pumping from Beaver Pond to Bland St. Tank.

(*c*) Pumping from the Ada Springs to the Twin Tanks.

(3) Pumping Stations:

(*a*) Ada Pumping Station:

1 horizontal cross compound Snow pumping engine 1,500,000 gals. per day against 305 lb. head.

1 Worthington double acting, horizontal, duplex pump, 1,500,000 gals. per day.

2 Sterling 148 H. P. boilers.

(*b*) Beaver Pond:

1 Worthington double acting horizontal duplex pump, 1,000,000 gals. per day.

1—80 H. P. Erie City boiler.

1—100 " " " "

(4) Spring Lines:

13.75 miles collecting and force mains 3″ to 10″.

(5) Distribution System:

Mains of all kinds	31.61	miles.
Cast Iron Mains	18.46	"
Wrought Iron Mains	13.15	"
Tons Cast Iron Pipe	1,664.3	
" " " specials	32.1	
Miles of mains per 1,000 population	2.18	
2—750,000 gal. steel tanks	....	
1—250,000 " " "	....	

(6) Services ..... 2,234.
Services per mile of pipe 70.7
Persons per service 6.5

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(7) Meters in Use ..... 1,467.
Per cent of services metered 65.6

(8) Hydrants:

Owned by Company	15
" " City	103

(9) Consumption: Average (1914) ..... 870,000 g. p. d.
Per Capita ..... 60 "
" Service ..... 389 "

(10) Pressure Range ..... 0 lbs. to 120 lbs.

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History of the Water Works.

The first work done in Bluefield for the establishment of a water works was the purchase of Springs Nos. 1 and 2 by the Norfolk and Western Railroad in 1888. A pipe line was laid to a wooden tank located near the site of the present Bland Street tank and from there to the railroad. In 1891, the Bluefield Water Works and Improvement Company took over the property and extended the collecting system to include Springs Nos. 3-4-5 and 6, and laid the distribution system between Lee and Mercer Streets as well as on the north side of the tracks. The Beaver Pond spring was purchased in 1892 and a pumping station erected to pump to a new steel tank—the present Bland Street tank. In 1900 it became necessary to further extend the water supply and the Ada Spring was purchased and developed. A reservoir was built to conserve the excess flow of the spring for use in the dry season, but its use was discouraged and finally forbidden by the city in 1909. In 1906, the water system was again increased by the erection of the present Ada Pumping Station and

the Twin Tanks. Additional springs have been added from time to time until at present there are 21 in use and 2 undeveloped. The pipe system has grown steadily and now reaches practically
457 every house in town, most of the exceptions being houses that are located too high on the hillsides to be served.

The city is divided into two districts. One is served by the Bland Street tank and the other by the Twin tanks. A float valve in the Bland Street tank operates on the high pressure line and keeps the tank filled at times when the Gravity Springs do not supply sufficient water. Three electric hydraulic valves connect the high pressure district with the low and are operated by switches in the Water Works office in case of a big fire down town.

458 Franchises.

Present: Mayor, Recorder and Council-men Nash & Foutz.

Minutes of meetings held Nov. 24, and Dec. 2nd, 1890, were read and approved, also special meeting of Jan'y 3, 1891.

Upon application of the Bluefield Water Works and Improvement Co., represented by L. C. Tabb, the following was read and adopted:

Whereas, the said Bluefield Water Works and Improvement Company, a corporation doing business in Mercer County, West Virginia, and now the owner of water-works in the City of Bluefield, is desirous to obtain the privilege of maintaining the said water-works and of constructing and maintaining additional works and facilities for maintaining transporting and furnishing water for the use of the said City of Bluefield, and the citizens thereof and the owners of property therein, for domestic and manufacturing purposes, and for all other uses and purposes for which it is desirable, for rent, lease, hire, sale and reward.

And whereas the Council of the said City of Bluefield deems it desirable and important to the said City of Bluefield and the inhabitants thereof, that the construction and maintenance of water-works for the purposes aforesaid, should be provided for, encouraged and facilitated, Therefore,

Be it ordained by the Council of the City of Bluefield that the said Bluefield Water Works and Improvement Company, its successors and assigns, have the right to construct and forever maintain, their said water-works, pipes and mains through, beneath, over, across and along any and all of the streets, alleys and public grounds of the said City of Bluefield, for the purposes of maintaining, supplying and furnishing water to the said City of Bluefield and the citizens and property holders thereof, for domestic and manufacturing purposes, and for all other purposes for which it is desirable, for rent, lease, hire, sale and reward, upon any terms and conditions that, from time to time may be agreed up- by and between the said Bluefield Water Works and Improvement Company, its successors or assigns, and the said City of Bluefield and other patrons and customers of the said Bluefield Water Works & Improvement Co., and its successors and assigns.

459 And be it further ordained by the Council of the City of Bluefield, that the aforesaid rights and privileges shall extend to all public grounds, street and alleys, hereafter acquired and established by the said City of Bluefield as well as those now in existence, owned and established, by the said City of Bluefield.

[Seal City of Bluefield, W. Va.]

STATE OF WEST VIRGINIA,
County of Mercer,
City of Bluefield, To wit:

I, J. T. Akers, Auditor of the City of Bluefield, do hereby certify that the foregoing and attached is a correct copy from the minutes of a meeting of the Council of said City held on the 20th, day of January, 1891.

Given under my hand and seal of said City this 11th day of January, 1915.

(Signed) J. T. AKERS,
Auditor.

460 At a special meeting of the Council of the Town of Bluefield, held at the office of Ash M. Prince in the said town on the 3d day of October, 1892, Present

J. M. Sanders, Mayor of said town and the following councilmen: Ash M. Prince, G. A. Shirey, E. P. Godby and W. T. Watkins.

Whereas the Council of the town of Bluefield at a meeting thereof, held on the 20th day of January, 1891, passed the following ordinance:

Upon application of the Bluefield Water Works and Improvement Company, represented by L. C. Tabb, the following was read and adopted:

Whereas: the said Bluefield Water Works and Improvement Company, a corporation doing business in Mercer County, West Virginia, and now the owner of water-works in the City of Bluefield, is desirous to obtain the privilege of maintaining the said water-works and of constructing, and maintaining, transporting and furnishing water for the use of the said City of Bluefield and the citizens thereof and the owners of property therein, for domestic and manufacturing, and for all other uses and purposes for which it is desirable, for rent, lease, hire, sale and reward.

And whereas, the Council of the said City of Bluefield deems it desirable and important to the said City of Bluefield and the inhabitants thereof that the construction and maintenance of water-works for the purpose aforesaid should be provided for, encouraged and facilitated; Therefore,

Be it ordained by the Council of the City of Bluefield that the said Bluefield Water Works and Improvement Company, its successors and assigns have the right to construct and forever maintain their said water-works, pipes and mains through, beneath, over, across and along any and all of the streets, alleys and public grounds of the

said City of Bluefield, for the purpose of maintaining supplying and furnishing water to the said City of Bluefield and the citizens and property holders thereof for domestic and manufacturing purposes and for all other purposes for which it is desirable, for rent, lease, hire, sale and reward, upon any terms and conditions that, from time to time may be agreed upon by and between the said Bluefield Water and Improvement Company, its successors and assigns and the said City of Bluefield and other patrons and customers of the said Bluefield Water Works and Improvement Company and its successors and assigns:

And be it further ordained by the Council of the City of Bluefield, that the aforesaid rights and privileges shall extend to all public grounds, streeets and alleys hereafter acquired and established
461 by the said City of Bluefield, as well as those now in existence, owned and established by the said City of Bluefield.

And whereas, it is suggested that said ordinance does not secure to the general public as fully as it should the right to have and demand water from said Bluefield Water Works and Improvement Company to the extent of its ability to furnish same, at fair and reasonable prices;

On motion—It is ordered and ordained,

First. That the said Bluefield Water Works and Improvement Company, shall, at all times, furnish this town, the general public, persons and corporations with water, to the extent of said Company's ability to furnish same, and at prices to be agreed on by said Company and to purchasers of water from said Company; the maximum charges to be made by said Company for water shall not exceed present rates for private consumers & 25¢ per 1,000 gals. for consumers by meter.

Second. That the general public shall, at all times, have the right to have and demand from said Bluefield Water Works and Improvement Company water for all proper and legitimate uses, to the extent of the ability of said Company to furnish same, on the terms hereinbefore prescribed.

Third. The said Bluefield Water Works and Improvement Company shall conduct its business of supplying the public with water in accordance with the ordinances of this town, heretofore or to be hereafter enacted, so long as said Company operates its said business under the authority conferred on it by the ordinances of this town, except that the maximum price to be charged for water, as fixed by this ordinance, shall not be changed without the consent of said Company.

Fourth. That the powers heretofore conferred upon said Bluefield Water Works and Improvement Company as shown by the ordinance heretofore enacted and incorporated herein, is hereby approved and confirmed.

The said Bluefield Water Works and Improvement Company, by L. C. Tabb, its agent, hereby consents to this ordinance and said

Company agrees to conduct its said business in accordance therewith, so long as it conducts its said business under the authority of this town.

[Seal City of Bluefield, W. Va.]

462 STATE OF WEST VIRGINIA,
County of Mercer,
City of Bluefield, To wit:

I, J. T. Akers, Auditor of the City of Bluefield, do hereby certify that the foregoing and attached is a correct copy from the minutes of a meeting of the Council of said City held on the 3rd day of October, 1892.

Given under my hand and seal of said City this 11th day of January, 1915.

(Signed) J. T. AKERS,
Auditor.

462½ *Preliminary Cost and Real Estate.*

463 Item No. 1. Preliminary Cost.

Includes all costs preliminary to the development of a precise plan of construction, such as:

(*a*) Business investigations and negotiations.
(*b*) Expert preliminary engineering reports.
(*c*) Legal Advice.
(*d*) Special engineering investigations for source of water supply.
(*e*) Optioning Real Estate (Cost of).
(*f*) Organization of Company.
(*g*) Acquisition of Franchise.
(*h*) And, in general, all costs such as are incidental to the proper placing of the enterprise upon a definite basis up to the point where detailed plans may be prepared and actual construction begun.

Item No. 2. Real Estate and Rights-of-Way.

(*a*) Real Estate.

The grant of spring tract includes the right-of-way for the pipe lines though the owner's farm.

Gravity Springs:

No. 1—11/21/'87—Estill Bailey & wife, Jos. I. Doran	0.5	acre.
No. 2— 9/28/'87—Jas. B. Bailey & wife " " "	0.5	"
No. 3— 7/23/'90—Jno. T. Bailey " " " & J. H. Dingee	0.5	"
No. 3— 2/21/'11— " " " & wife, B. W. W. & I. Co.	1.128	"
No. 4— 7/23/'90— " " " Jos. I. Doran & J. H. Dingee	0.5	"
No. 4— 2/21/'11— " " " & wife, B. W. W. & I. Co.	1.760	"
No. 5— 7/17/'90—A. W. Bailey & wife, Jos. I. Doran & J. H. Dingee	0.5	"
No. 6— 7/17/'90—A. J. Bailey & wife, Jos. I. Doran & J. H. Dingee	0.5	"
No. 6— 7/31/'06—C. A. " & wife, B. W. W. & I. Co.	1.91	"
No. 6— 5/20/'08— " " " " " "	2.50	"
7 & 8— 5/20/'08—C. A. " et ux., et al., "	1.50	"
No. 9— 6/ 4/'08—Robt. W. Tuggle & wife, "	1.17	"
No. 10— 6/ 4/'08— " " " " " "	0.30	"
No. 11— 6/ 4/'08— " " " " " "	0.35	"

No. 12—12/13/10—Thos. P. Morgan & wife, B. W. W. & I. Co.	0.35	A.	
" 13—12/13/10— " " " " " "	0.37	"	
" 14—12/13/10— " " " " " "	0.51	"	
" 15— 6/7/09—R. H. Bailey " " "	236.25	"	
" 16— 7/22/10— " " " " " "	1.06	"	
" 17— 7/22/10—Ballard P. Wilson " "	1.99	"	
" 18— 7/22/10—Walter T. Bailey " " "	41.88	"	
" 18—12/24/14— " " " " " "	1.11	"	
" 20—10/14/05—W. H. Thompson " " "	.0578	"	
" 21—12/20/00— " " " " " "	2.00	"	
" 22— 10/1/07—Estill Bailey " " "	0.46	"	

Jarrell Spring:

No. 19—10/14/05—Martha S. Jarrell et al., B. W. W. & I. Co.	1.00	A.	

Beaver Pond Spring:

No. 23— 5/5/92—Carmack Bailey et al., B. W. W. & I. Co.	1.00	A.	

Twin Tanks:

1/22/97—H. M. Nash, et al., B. W. W. & I. Co.	15.25	A.	

Bland Street Tank:

Lot 5—Sec. 44—Bluefield.

Office:

Lot 1—Sec. 22—Bluefield.

Ada Pumping Station:

7/27/00—Estill Bailey & wife, B. W. W. & I. Co.	0.50	A.
10/1/07— " " " " "	1.12	"

Honaker Mill, Reservoir & Dam:

1/22/00—E. L. Bailey & wife, B. W. W. & I. Co.	99.36	A.

Ruble Farm:

1/18/08—H. C. Ruble & wife, B. W. W. & I. Co.	46.50	A.

465 (*b*) Rights-of-Way.

Beaver Pond and Gravity Spring Lines:

9/28/87—Nancy Williams to Jos. Doran.
" —Cathrine Davidson to Jos. I. Doran.
" —Eliza Bailey " " " "
8/14/90—Mary E. Hale " " " " & J. H. Dingee.
" —Catherine P. Davidson to Jos. I. Doran & J. H. Dingee.
3/10/92—E. J. Bailey & wife to B. W. W. & I. Co.
5/15/92—Eliza Bailey " "
" —H. B. Bailey & wife " "
" —Jas. R. Calfee & wife to "
" —Jno. P. Williams et al. to "
" —T. M. Calfee et al. " "

Ada Spring Lines:

2/28/00—Boyd S. Belcher & wife to B. W. W. & I. Co.
" —Jas. Hearn " " " "
" —Mary E. Roland & husband to "
7/13/00—R. M. Calfee " "
" —Jas. Hearn & wife " "
" —E. J. Bailey & wife " "
" —Geo. P. Bailey & wife " "
" —Ellen P. Bailey " "
7/27/00—Estill Bailey " " " "
7/30/00—J. W. Caldwell " " " "
8/6/00—G. B. Higginbotham et al. " "
8/16/00—Rebecca Bailey " "
10/21/09—Lucy J. Taylor " "
7/22/10—Jno. W. Wilson & wife " "
8/4/10—A. B. Helton " " " "

Jarrell Spring Line:

2/28/00—Jno. Eagle " "
12/6/09—C. W. Mills et al. " "

(*c*) Buildings and Improvements.

At Beaver Pond Spring (Exhibits Nos. 1.—2*a* & 2*b*):

One story frame cottage at west end of station lot. Built about 1892. Well painted and in good condition.
Area of main floor 708 sq. ft.
Cubic contents, outside dimensions from bottom of foundation to average height of roof 11,376 cu. ft.

466 Built of frame throughout with outside walls weather boarded; inside walls and ceiling made of beaded pine ceiling. Yellow pine floors. Roof, of sheet iron. Foundation is of

stone set in lime mortar and is 4 feet high x 8 inches thick. The living rooms are painted inside.

The house contains three rooms and one enclosed porch.

At Ada Pumping Station:

3-room cottage built about 1902. The building if of frame construction, walls and ceiling ceiled with beaded tongue and grooved pine ceiling. The floors are of pine and the outside walls of 5" weather boarding. It has a gabled roof covered with Carey roofing. The building is set on posts. Unpainted and in very poor repair.

Cubic contents, outside dimensions from top of foundation to average height of roof 6,250 cu. ft.

Area of main floor 457 sq. ft.

At Spring No. 6:

Tool House built out of rough lumber about 1911.

Area of floor 151 sq. ft.

Cubic contents, outside dimensions from bottom of sills to average height of roof 1,238 cu. ft.

Frame construction. Walls made of 1" x 10" boards nailed vertically with 1" x 4" strips over joints. Roof planked and covered with tar paper. Rough floor over half of building. Unpainted and in poor repair. Not used.

At Spring No. 15 (Henry Bailey farm):

This farm is in good order. It has a young orchard of about 40 trees, a 2 story house, barn, and a spring house.

467 Farm House (Exhibits No-. 3 & 4):

A two story frame structure on masonry piers built about 1900. The walls and ceiling are ceiled with chestnut ceiling and the floors are of pine. The roof is made of dipped and painted shingles and was put on in 1906. All of the doors and window trims are of pine. The exterior is painted. The house is in good repair.

Cubic contents, outside dimensions from top of piers to average height of roof 13,300 cu. ft.

Area of main floor 680 sq. ft.

The house contains 8 rooms and has two porches.

Barn & Crib (Exhibit No. 5):

Building made of rough lumber with a roof of dipped and painted shingles. It has four stalls and a haymow. Near one end is located a corn crib made of slats. This crib and the space between it and the barn is covered with a tin roof.

Cubic contents, outside dimensions from bottom of sills to average height of roof 10,640 cu. ft.

Spring House:

The building is of rough frame construction with a shingle roof, which overhangs 4′ 0″ at one end.
Cubic contents, outside dimensions, 410 cu. ft.

Fence:

4,450 lin. ft. rail fence.
7,200 " " woven wire fence—1 strand barb wire on top.
720 fence posts—8′ long—locust.

468 At Spring No. 21 (Ada Spring):

A small farm house and outbuildings are located near this spring. Built about 1902.

Farm House (Exhibit No. 6.):

One story frame structure with shingle roof. Rooms ceiled and floored with pine. Unpainted.
Cubic contents, outside dimensions, 7,100 cu. ft.
The house contains four rooms.

Barn:

Rough frame structure containing 1 stall and a haymow covered with a clapboard roof.
Cubic contents, outside dimensions, 2,170 cu. ft.

Spring House:

Frame building covered with 1″ sheeting and weather board. Roof, dipped and painted shingles on sheeting. Overhangs 2′ 4″ at one end. Floor of 1″ pine.
Cubic contents, outside dimensions, 425 cu. ft.

Dairy or Root House:

Frame house covered with earth. Walls and roof of 2″ plank, floor 1″ oak. .58 lin. ft. 8″ shelving.
Cubic contents, outside dimensions, 186 cu. ft.
400 board feet rough lumber in the house.

Tool House:

Rough frame building with tar paper roof.
Cubic contents, outside dimensions, 840 cu. ft.

469 Board Walks:

90 lin. ft. 2′ 9″ wide = 400 bd. ft.

Fences:

1,350 bd. ft. solid board fence (171 lin. ft. 4′ high posts spaced 6′ apart).
3,750 bd. ft. solid board fence (441 lin ft. 5′ high posts spaced 7′ apart).
1,750 lin. ft. barb wire.
55 posts 8′ long (small).

At Ruble Farm.

Farm House (Exhibits Nos. 7 & 8):

One story frame house on cut stone foundation with large outside cut stone chimney. Roof of tin. Interior ceiled and floored. Unpainted.
Cubic contents, outside dimensions, 8,100 cu. ft.
550 cu. ft. cut stone in chimney and foundation.
House contains five rooms.

Tool House:

Weather boarding on rough frame with clapboard roof. No inside finish, doors or windows—openings only. Unpainted.

Office Building (Exhibits Nos. 9 & 10):

The original office building was destroyed by fire in 1912 and the present structure erected on the same site immediately afterward.
The main floor is built several feet above the ground level and has a basement under it. The foundation is of concrete extend-
470 ing to the main floor level in the front part of the building and to the basement level in the rear wing, with a brick wall on the latter part extending up to the main floor. All outside walls above the ma-n floor level are of rough texture brick veneer set against building paper on 1″ sheathing. The roof is of sheathing covered with galvanized shingles. It contains four dormer windows.
The basement has a concrete floor and is divided into rooms by board and plaster walls.
The main floor is plastered throughout and the front two rooms papered while the attic is unfinished excepting for a rough floor.
All windows in the basement are barred. The main floor trim is all first quality pine, painted with white enamel. The doors and windows are fitted with brushed brass fixtures.
Two iron safes are built into the wall and a vault 19′ 0″ x 9′ 6″ in plan, made of concrete and brick, fitted with iron doors is set in the middle of the building.
The entire building is electric lighted and is heated with a hot water heating system. Two toilets and a sink are in the base-
471 ment and there is a sink and a lavatory on the main floor Shelves and cupboards are built into the walls in the laboratory.

A speaking tube system is enclosed within the walls. Before the building could be erected, the lot had to be graded down.

Cubic contents, outside dimensions, from main floor level to average height of roof 37,300 cu. ft.

Cubic contents of basement 13,010 cu. ft.

420 cu. yds. grading on lot.

The building contains the following rooms:

Basement:

1 meter testing room	floor area,	170	sq ft.
1 stock room	" "	220	" "
1 toilet and hall	" "	130	" "
1 shop room	" "	520	" "
1 boiler room	" "	76	" "

Main Floor:

1 room,	floor, area,	376	sq. ft.
1 "	" "	227	" "
1 "	" "	231	" "
1 "	" "	147	" "
1 laboratory	" "	153	" "
1 store room	" "	71	" "
1 hall	" "	77	" "

Garage (Exhibits Nos. 9 & 11):

The garage is a brick building built in connection with the office building. The foundation is of concrete with outside walls, 8" thick.

The roof is of tin on 1" sheathing and is supported from the
472 side walls. The center beam is trussed with two rods and turnbuckles. A 6' x 6' galvanized iron sky light is placed over the room used as a blacksmith shop. The floor of the vestibule and truck room is of concrete, the latter containing a concrete pit 3' 0" x 7' 0" x 4' 6" (inside dimensions) with a loose board cover made of 2" x 8" lumber. Interior partition, walls and ceilings are covered with pressed galvanized iron. All windows are barred. The garage door is made in four leaves 8' 6" x 2' 0" of two thicknesses of 1" plank with trim. The building is wired and a chimney made of a joint of 10" C. I. pipe is located in the blacksmith shop.

Cubic contents, outside dimensions, from bottom of fastings to top of walls 9,200 cu. ft.

The building contains the following rooms:

1 truck room,	357	sq. ft.
1 blacksmith shop,	138	" "
1 vestibule,	85	" "

473 The water supply (Exhibits Nos. 12, 13, 14, 15*a* & 15*b*):

The water supply is derived from a series of springs located along the mountain ridge which lies to the south of the city. These springs

appear out of the rocks and most of them lie half way up the mountain side in places difficult of access. At each spring a small tract of land has been purchased by the Water Company, cleared of all brush and dead wood and fenced as a protection.

The water is gathered in vitrified tile pipes laid with open joints in trenches approximately two feet wide, which were afterward filled with coarse rock nearly to the surface and covered with earth. In this manner the water is gathered without allowing it to come to the surface of the ground and become contaminated. Where there was any possibility of surface water getting to the tile lines, ditches, concrete walls or other means were used to prevent this water from being collected.

The tile infiltration lines are quite extensive for some of the springs as they have been run out to catch the water wherever it appears. These lines were very difficult to lay in practically all cases, as the trenches lie through rock and had to be blasted. The water is conducted to a small concrete basin over which is a spring house of either frame or concrete construction.

474 Owing to the location of these springs all work connected with the construction of the infiltration lines, head houses and pipe lines up the mountain side was extremely difficult. Materials had to be carried by hand in many cases for long distances through the woods over the rocky ground, as the grade was too steep, the undergrowth too dense or the ground too rocky to permit teams to be used.

There are twenty-three springs in the collecting system, although some of these springs contain more than one head house and set of infiltration lines. The system is divided into parts which have to be cared for in various ways before the water can be delivered to the city distribution system. One spring, Spring No. 23 or the Beaver Pond Spring, is so located that it has to be pumped, while the next ten springs (The Gravity Springs) lying to the east are able to deliver their water to the Bland Street tank by gravity. The next eleven springs ("The Ada Springs") lying still further east, deliver their water to the Ada Pumping Station by gravity from where it is lifted 536 feet to the Twin Tanks. The Jarrell Spring, the farthest one east, is approximately 7½ miles from the city and has not been developed.

475 Item No. 3. The Gravity Springs (Exhibit No. 12).

(*a*) Spring No. 1 (Exhibits Nos. 12 & 16).

The tract comprises ½ acre which has been cleared of all underbrush and dead wood. It is surrounded by a woven wire fence and two strings of barb wire. One head house with a concrete basin and frame superstructure is located at this spring.

All material had to be carried a distance of approximately 500 feet over rock ground.

Spring purchased in 1888, but present head house and infiltration lines built in 1906-1907.

Quantities:

(1) Land Improvements:

Clearing ½ acre of brush and dead wood.
100 cu. yds. earth and loose rock excavation in leveling up land.
36½ rods woven wire fence.
600 lin. ft. barb wire.
60 fence posts 8 ft. long, chestnut.

(2) Infiltration Lines:

20 lin. ft. 6″ Vit. Tile in 4′ rock trench.
20 " " 4″ " " " " " "
13 cu. yds. blasted stone hammered to small bits.

(3) Head House:

Area of floor 22½ sq. ft. Cu. content, outside dimensions from top concrete to ave. height of roof, 174 cu. ft.
4. cu. yds. rock excavation.
1.7 " " concrete in basin.
1—Frame superstructure bolted to concrete. Framework 2″ x 4″ pine covered with 1″ rough sheeting and pine weather boarding with trim. Roof painted and dipped shingles on 1″ sheeting.
476 1 door made of 2 layers of 1″ pine tongue and groove lumber. and fitted with 3 strap hinges and padlock. Building painted 2 coats outside.
1—Iron screen over outlet box 8″ x 16″.

(4) Piping in Head House:

Blow-Off. (Ave. Depth 2′.)
9′ 0″—4″ C. I. Pipe, H. & S.
9′ 0″—4″ Vit. Tile.
1—4″ Gate Valve.

(*b*) Spring No. 2 (Exhibits Nos. 12 & 16).

This tract comprises ½ acre and has been cleared of all brush and dead wood. The fence is of woven wire, surmounted by two lines of barb wire. Half of the post holes required blasting. One head house having a concrete basin and frame superstructure is located at this spring.

All material had to be carried approximately 1,000 feet up the mountainside.

Spring purchased in 1888; developed in 1906-1907.

Quantities:

(1) Land Improvements:

Clearing ½ acre of brush and dead wood.
100 cu. yds. of earth fill (ave. 300′ wheelbarrow haul).
39 rods woven wire fence.
636 lin. ft. barb " "
64 fence posts 8 ft. long, chestnut.

477 (2) Infiltration Lines:

90 lin. ft. 4″ vit. tile in 4′ trench (½ clay and ½ boulders).
20 cu. yds. boulders hammered to small pieces.

(3) Head House:

Area of floor—21 sq. ft.
Cubic contents, from top of concrete basin to average height of roof, outside dimensions—167 cu. ft.
4¾ cu. yds. excavation (earth).
2 " " concrete in basin.
1—8″ x 16″ Iron screen over outlet box.
1—Frame superstructure, bolted to concrete. Framework 2″ x 4″ pine covered with 1″ rough sheeting and pine weather boarding and trim. The house is floored with 2″ rough oak, excepting for an opening 2′ 10″ x 1′ 4″ and has a door made of two thicknesses of 1″ pine tongue and grooved lumber, fitted with 3 strip hinges and padlock. Building painted 2 coats outside.

(*a*) Piping in Head House:

Blow-off (Ave. Depth 2′).

5′ 6″—4″ C. I. pipe H. & S.
10′ 0″—4″ Vit. tile.
1—4″ C. I. gate valve, H. & S.

(*c*) Spring No. 3 (Exhibits Nos. 12 & 16).

Area of tract 1.628 acres. Land cleared of brush and dead wood and fenced with a woven wire fence. The head house has a concrete basin and frame superstructure.
478 All material had to be carried 500 feet up a steep rocky incline.
Spring purchased in 1890 and developed 1906-1907.

Quantities:

(1) Land Improvements:

Clearing 1.628 acres of dead wood and brush.
75 cu. yds. of grading around head house.
115 rods woven wire fence.
190 fence posts, 8 feet long, chestnut.

(2) Infiltration Lines:

10 lin. ft. 6″ Vit. tile in 4′ trench (2/3 solid rock).
1038 " " 4″ " " " 4′ " (2/3 " ").
234 cu. yds. boulders hammered to small pieces.

(3) Head House:

Area of Floor—18.6 sq. ft.
Cubical contents, outside dimensions, from top of concrete basin to average height, of roof—153 cu. ft.
4¾ cu. yds. excavation (earth).
2 " " concrete in basin.
1—8″ x 18″ Iron screen over outlet box.
1—Frame superstructure bolted to concrete basin. Framework 2″ x 4″ pine covered with 1″ rough sheeting and pine weather boarding and trim. The roof is made of dipped and painted shingles laid on 1″ rough sheeting. 1 door, made of 2 layers tongue and grooved 1″ pine fitted with three strap hinges and padlock. Building painted 2 coats outside.

479 (4) Piping in Head House:

Blow-off (Ave. depth 2′ 0″).
4′ 0″—4″ C. I. pipe, H. & S.
8′ 0″—4″ Vit. tile.
1—4″ gate valve, H. & S.

(*d*) Spring No. 4 (Exhibits Nos. 12 & 17):

Area of tract 2.26 acres. Land cleared of brush and dead wood and fenced with a woven wire fence. 2 head houses, each of frame on concrete basin, are at this spring.
The material for the lower spring had to be carried 300 feet over extremely rough ground, while that for the upper was carried 500 feet.
Spring purchased in 1890; developed 1906-1907.

Quantities:

(1) Land Improvement:

Clearing 2.26 acres of dead wood and brush.
55 cu. yds. grading around head houses.
118 rods woven wire fence.
196 fence posts 8 ft. long, chestnut.

Lower Spring (No. 4 A):

(1) Infiltration Lines:

10′ 0″—6″ vit. tile in 4′ trench (½ rock).
325′ 0″—4″ " " " 4′ " (½ ").
75—cu. yds. rock hammered into small pieces.

(2) Head House.

Area of floor 21 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof—126 cu. ft.
480 4 cu. yds. earth excavation.
1.8 cu. " concrete in basin.
1—8" x 18" iron screen over outlet box.
1—Frame superstructure bolted to concrete basin. Framework 2" x 4" covered with 1" rough sheeting and pine weather boarding and trim. Roof, dipped and painted shingles on 1" rough sheeting—1 door made of two layers 1" tongue and grooved pine and fitted with 2 strap hinges and a padlock. Building painted 2 coats outside.

(3) Piping in Head House.

Blow-off (Ave. Depth 1½ feet).
4' 0"—4" C. I. pipe H. & S.
5' 0"—4" vit. tile.
1—4" gate valve, H. & S.

Upper Spring (No. 4 B):

(1) Infiltration Lines:

10' 0"—6" vit. tile in 4' trench (2/3 rock).
625' —4" " " " 4' " (" ").
140—cu. yds. rock hammered into small pieces.

(2) Head House:

Area of floor 19 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof—113 cu. ft.
3 cu. yds. excavation (earth).
1.7 cu. yds. concrete in basin.
1—8" x 17" Iron Screen over outlet box.
1—Strainer over overflow.
1—Frame superstructure bolted to concrete basin. Framework 2" x 4" pine covered with 1" rough sheeting and weather
481 boarded. Roof, dippes and painted shingles laid on 1" rough sheeting. 1 door made of 2 layers tongue and grooved 1" pine, fitted with 2 strap hinges and a padlock. Lumber, pine and poplar. Building unpainted.

(3) Piping in Head House:

Overflow (Ave. depth 2' 0"):

48' 0"—4" vit. tile in 2' trench.

Blow-off (Ave. depth 2′ 0″):

6′ 0″—4″ C. I. pipe H. & S.
6′ 0″—4″ Vit. tile.
1—4″ gate valve H. & S.

(e) Spring No. 5 (Exhibits Nos. 12 & 17).

Area of tract ½ acre. Land cleared of brush and dead wood and fenced with a woven wire fence. 1 head house with concrete basin and frame superstructure. All material had to be carried 500 feet. Spring purchased in 1890; developed 1906-7.

Quantities:

(1) Land Improvements:

Clearing ½ acre of dead timber and brush.
20 cu. yds. grading at head house.
36½ rods woven wire fence.
60 fence posts 8 feet long, chestnut.

(2) Infiltration Lines:

10′ 0″—6″ vit. tile in 4′ trench (½ rock).
175′ 0″—4″ " " " 4′ " (½ ").
41—cu. yds. rock hammered into small pieces.

482 (3) Head House:

Area of floor 13.5 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof—82 cu. ft.
2.5 cu. yds. excavation (earth).
1.4 cu. yds. concrete in basin.
1 8″x15″ iron screen over outlet box.
1 Frame superstructure bolted to concrete basin. Framework 2″x4″ covered with 1″ rough sheeting, weather boarding and trim. Roof, dipped and painted shingles on 1″ rough sheeting. 1 door made of 2 layers tongue and grooved 1″ pine fitted with 2 strap hinges and a padlock. Outside of building painted 2 coats.

(4) Piping in Head House:

Blow-Off (Ave. depth 2′ 0″):

4′ 0″—4″ C. I. pipe H. & S.
4′ 0″—4″ vit. tile.
1—4″ gate valve, H. & S.

(*f*) Spring No. 6 (Exhibits Nos. 12 & 17).

Area of tract 4.91 acres. Land cleared of all dead wood and brush and fenced with woven wire fence. 2 head house- are at this spring, also a rough frame tool house and a short concrete retaining wall behind which is a small filter consisting of 20 yds. crushed stone covered with earth. All material could be hauled to the head house sited, but the pipe for the infiltration lines had to be distributed by hand.

Spring purchased in 1890; developed in 1908.

483 Quantities:

Clearing 4.91 acres of dead wood and brush.
200 cu. yds. grading.
158 rods woven wire fence.
260 fence posts 8 feet long, chestnut.

Upper Spring (No. 6 A):

(1) Infiltration Lines:

Little shooting required although trenches were full of boulders.
327′ 0″—6″ Vit. Tile in 5′ trench.
2,203′ 0″—4″ " " " 5′ "
562 cu. yds. boulders hammered into small pieces.

(2) Head House:

Area of floor 29 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof—200 cu. ft.
7½ cu. yds. excavation (earth).
3 cu. yds. concrete in basin.
1 7″x20″ iron screen over outlet box.
1 strainer over overflow.
1 Frame superstructure bolted to concrete basin. Framework 2″x4″ covered with 1″ rough poplar sheeting, weather boarding and trim. Roof, dipped and painted shingles on 1″ rough sheeting. 1 door made of 2 layers 1″ pine tongue and grooved lumber, fitted with 2 strap hinges and a padlock. Building painted 2 coats outside.

(3) Piping in Head House:

Blow-Off (Ave. depth 2′ 0″):

4′ 6″—6″ C. I. pipe H. & S.
30′ 0″—6″ Vit. tile.
1—6″ Gate valve.

Overflow (Ave. depth 1′ 0″):

13′ 0″—6″ Vit. Tile.

484 Lower Spring (No. 6 B):

(1) Infiltration Lines:

395′ 0″—6″ Vit. tile 6′ trench.
595′ 0″—4″ " " 4′ "
220 cu. yds. boulders hammered to small pieces.

(2) Head House:

Area of floor 18 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof—109 cu. ft.
5 cu. yds. excavation (earth).
2.3 cu. yds. concrete in basin.
1 8″ x 20″ iron screen over outlet.
1 Strainer over overflow.
1 Frame superstructure—pine and poplar—Framework 2″ x 4″ covered with 1″ rough sheeting and weather boarding with trim. Roof, stained and painted shingles on 1″ rough sheeting—1 door made of 2 layers tongue and groove 1″ pine fitted with 2 strap hinges and padlock. Building painted 2 coats outside.

(3) Piping in Head House:

Overflow:

3′ 0″—6″ Vit. tile.

Blow-Off:

4′ 6″—4″ C. I. pipe H. & S.
20′ 6″—4″ Vit. tile.
1—4″ gate valve, H. & S.

(4) Concrete Retaining Wall:

1 cu. yd. concrete in 10″ wall 2′ high.
20 " " boulders hammered to small pieces.

485 (5) Tool House:

Made of rough sawed 1″ oak and poplar boards 10″ x 12″ wide nailed vertically to framework of 2 x 4s and 2 x 6s with 1 x 4 strips nailed over joints. Roof, tar paper on 1″ rough sheeting. ½ of building floored.
Area of floor 155 sq. ft.
Cubic contents, outside dimensions from bottom of sills to average height of roof 1,240 cu. ft.

(*g*) Spring No. 7 & 8 (Exhibits Nos. 12 & 18).

Area of tract 1.5 acres. Land cleared of all dead wood and brush and fenced with woven wire fence. 3 head houses are on this tract. The clearing was very excessive here as the spot was used for a rotten log dump.

Spring purchased in 1908; developed in 1908.

Quantities:

Land Improvements:

Clearing 1.5 acres of brush and dead wood.
94 rods woven wire fence.
155 fence posts 8 ft. long, chestnut.

East Spring (No. 7 A):

(1) Infiltration Lines:

20'—4" Vit. tile 4' deep (rocky).
4½ cu. yds. boulders hammered to small pieces.

486 (2) Head House:

Area of floor 15 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof—90 cu. ft.
2.5 cu. yds. excavation (earth).
1.6 cu. yds. concrete in basin.
1—8" x 14" iron screen over outlet box.
1—Strainer over overflow.
1—Frame superstructure—pine and poplar. Frame 2" x 4" covered with 1" rough sheeting and weather boarding with trim. Roof, dipped and painted shingles on 1" rough sheeting. 1—door made of 2 layers 1" tongue and groove pine, fitted with 2 strap hinges and a padlock. Building painted 2 coats outside.

(3) Piping in Head House:

Blow-off (Ave. depth 1½ ft.):

4' 0"—4" C. I. pipe, H. & S.
10' 0"—4" Vit. tile.
1—4" gate valve H. & S.

Overflow:

7' 6"—4" Vit. tile.

Lower Spring (No. 7 B):

(1) Infiltration Lines:

560′ 0″—4″ Vit. title in 3′ trench (solid rock).
83 cu. yds. rock hammered to small pieces.

(2) Head House:

Area of floor 26 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof 155 cu. ft.
487 4.5 cu. yds. excavation (earth).
2.2 cu. yds. concrete in basin.
1—6″ x 14″ iron screen over outlet box.
1—Strainer over overflow.
1—Frame superstructure bolted to concrete basin—pine and poplar. Framework 2″ x 4″ with 1″ rough sheeting and weather boarding with trim. Roof, dipped and painted shingles laid on 1″ rough sheeting, 1 door made of 2 layers 1″ tongue and grooved pine, fitted with 2 strap hinges and a padlock. Building painted 2 coats outside.

(4) Piping in Head House:

Blow-off (Ave. cut 1½ ft.):

4′ 0″—4″ C. I. pipe, H. & S.
25′ 0″—4″ Vit. tile.
1—4″ gate valve, H. & S.

Overflow:

15′ 0″—4″ vit. tile.

West Spring (No. 7 C):

(1) Infiltration Lines:

250′ 0″—4″ vit. title in 4′ trench (½ solid Rock).
55 cu. yds. rock hammered into small pieces.

(2) Head House:

Area of floor 15 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof 89 cu. ft.
3.3 cu. yds. excavation (earth).
1.7 cu. yds. concrete in basin.
1—10″ x 15″ iron screen over outlet.
1—Strainer over overflow.

1—Frame superstructure bolted to concrete basin—pine and poplar. Framework 2″ x 4″ with 1″ rough sheeting and weather
488 boarding with trim. Roof, dipped and painted shingles on 1″ rough sheeting. 1 door made of 2 layers 1″ tongue and grooved pine, fitted with 2 strap hinges and a padlock. Building painted two coats.

(3) Piping in Head House:

Blow-off (Ave. depth 2 feet):

45′ 6″—4″ C. I. pipe, H. & S.
1—4″ gate valve, H. & S.

Overflow:

11′ 6″—4″ vit. tile.

(*h*) Spring No. 9 (Exhibits Nos. 12 & 19).

Area of tract 1.17 acres. Land cleared of brush and dead wood and fences with woven wire fencing. One head house at this spring. Carried all material 500 feet.
Spring purchased in 1908—developed in 1908.

Quantities:

(1) Land Improvements:

Clearing 1.17 acres of brush and dead wood.
88 rods woven wire fence.
145 posts 8′ long, chestnut.

(2) Infiltration Lines:

750′ 0″—4″ vit. tile 4′ trench (solid rock).
167 cu. yds. rock hammered to small pieces.

489 (3) Head House:

Area of floor 21 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof 127 cu. ft.
5 cu. yds. excavation (rock).
2.6 cu. yds. concrete in basin.
1—8″ x 20″ iron screen over outlet.
1—Strainer.
1—Frame superstructure bolted to concrete basin—pine and poplar. Framework 2″ x 4″ covered with 1″ rough sheeting and weather boarding with trim. Roof, dipped and painted shingles on 1″ rough sheeting. 1 door made of 1″ tongue and groove pine, fitted with 2 strap hinges and one padlock. Building painted 2 coats outside.

(*i*) Spring No. 10 (Exhibits Nos. 12 & 20).

Area of tract 0.3 acres. Land cleared of brush and dead wood and fences with woven wire fence. 1 head house is located at this spring. Carried material 500 feet.
Spring purchased in 1908—developed in 1908.

Quantities:

(1) Land Improvements:

Clearing 0.3 acre of brush and dead wood.
28 rods woven wire fence.
46 fence posts 8 feet long, chestnut.

(2) Infiltration Lines:

30′ 0″—4″ Vit. tile in 3′ trench (½ rock).
25′ 0″—4″ " " " 4′ " (earth).
50′ 0″—4″ " " " 4′ " (rock).
19 cu. yds. rock hammered to small pieces.

490 (3) Head House:

Area of floor 21 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof 127 cu. ft.
5 cu. yds. excavation (earth).
2.6 cu. yds. concrete in basin.
1—10″ x 16″ iron screen over outlet box.
1—Strainer.
1—Frame superstructure bolted to concrete basin—pine and poplar. Frame of 2″ x 4″ with 1″ rough sheeting and weather boarding with trim. Roof, dipped and painted shingles laid on 1″ rough sheeting. 1 door made of 1″ tongue and grooved lumber, fitted with 2 strap hinges and a padlock. Building painted 2 coats.

(4) Piping in Head House:

Blow-off (Ave. depth 2′ 0″):

5′ 0″—4″ C. I. pipe H. & S.
35′ 0″—4″ vit. tile.
1—4″ gate valve, H. & S.

Overflow:

19′ 0″—6″ vit. tile.

(*j*) Spring No. 11 (Exhibits Nos. 12 & 20).

Area of tract 0.35 acres. Land cleared of all brush and dead wood and fenced with woven wire fence. 1 head house at this spring.

Spring purchased in 1908—developed 1908.

491 Quantities:

(1) Land Improvements:

Clearing 0.35 acres of brush and dead wood.
40½ rods of woven wire fence.
67 fence posts 8 feet long, chestnut.

(2) Infiltration Lines:

10' 0"—4" Vit. tile 4' trench (earth).
2 cu. yds. rock hammered to small pieces.

(3) Head House:

Area of floor 13½ sq. ft.

Cubic contents, outside dimensions from top of concrete basin to average height of roof 72 cu. ft.

4 cu. yds. excavation (earth).

1.7 cu. yds. concrete in basin.

1—6" x 13" iron screen over outlet box.

1 Frame superstructure bolted to concrete basin—pine and poplar. Frame 2" x 4" covered with 1" rough sheeting and weatherboarding with trim. Roof, dipped and painted shingles, on 1" rough sheeting. 1 door of 2 layers of 1" tongue and groove lumber fitted with 2 strap hinges and a padlock. Building painted 2 coats outside.

(4) Piping in Head House:

Blow-off (Ave, depth 2' 0"):

13' 6"—4" C. I. pipe, H. & S.
1—4" gate valve, H. & S.

Overflow:

7' 0"—4" C. I. pipe, H. & S.

492 Item No. 4. The Ada Springs (Exhibit No. 12).

(*a*) Spring No. 12 (Exhibits Nos. 12 & 20).

Area of tract 0.354 acres. Land cleared of brush and dead wood and fenced with woven wire fence. 1 head house. Carried material 400 feet.

Spring purchased in 1910—developed 1912.

Quantities:

(1) Land Improvements:

Clearing 0.354 acres of brush and dead wood.
33 rods woven wire fence.
54 fence posts 8 feet long, chestnut.
300 cu. yds. grading.

(2) Infiltration Lines:

130' 0"—4" tile 10' trench (½ large rocks).
85' 0"—4" " 6' " " " "
153' 0"—4" " 6' " " " "
82 cu. yds. stone hammered to small pieces.

(3) Head House:

Area of floor 23 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof 144 cu. ft.
8 cu. yds. excavation (earth).
3.2 cu. yds. concrete in basin.
1—6" x 20" iron strainer over outlet box.
1 Frame superstructure bolted to concrete basin—pine and poplar. Frame of 2" x 4" covered with 1" rough sheeting and weather boarding with trim. Roof, dipped and painted shingles on 1" rough sheeting. 1 door made of 2 layers 1" tongue and groove lumber fitted with 2 strap hinges and Yale lock. Building painted 2 coats outside.

(4) Piping in Head House:

Blow-off (Ave. depth 2 ft.):

4' 6"—6" C. I. pipe H. & S.
8' 0"—6" vit. tile.
1—6" gate valve, H. & S.

Overflow:

12' 0"—4" vit. tile.

493 (*b*) Spring No. 13 (Exhibits Nos. 12 & 20).

Area of tract 0.372 acres. Land cleared of all brush and dead wood and fenced with woven wire fencing. Owing to the character of the ground, a ditch was required on both sides of the spring to carry away the surface water. 1 head house at this spring.
Spring purchased in 1910—developed in 1912.

Quantities.

(1) Land Improvements:

Clearing 0.372 acres of brush and dead wood.
31½ rods woven wire fence.
52 fence posts 8 feet long, chestnut.
600 cu. yds. grading (leveling up).
45 cu. yds. excavating in 300' ditch.

(2) Infiltration Lines:

200' 0"—4" tile in 5' trench (loose rock & earth).
45 cu. yds. stone hammered into small pieces.

(3) Head House:

Area of floor 23 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof 150 cu. ft.
6.5 cu. yds. excavation (earth).
3.3 " " concrete in basin.
1—5" x 20" iron screen over outlet box.
1 Frame superstructure bolted to concrete basin—pine and poplar. Frame 2 x 4's covered with 1" rough sheeting and weather boarding with trim. Roof, dipped and painted shingles on 1" rough sheeting. 1 door made of 2 layers 1" tongue and groove lumber fitted with 2 strap hinges and a Yale lock. Building painted 2 coats outside.

494 (4) Piping in Head House.

Blow-off:

3' 6"—4" C. I. pipe H. & S.
30' 0"—4" vit. tile.
1—4" gate valve, H. & S.

Overflow:

7' 0"—4" vit. tile.

(c) Spring No. 14 (Exhibits Nos. 12 & 20)

Area of tract 0.509 acres. Land cleared of all brush and dead wood and surrounded with a woven wire fence. This tract extends across the county road and ditches were dug to lead the run-off water away from the spring. A large amount of grading was required on this tract. 1 Head house at this place.
Spring purchased in 1910—developed in 1912.

Quantities:

(1) Land Improvements:

Clearing 0.509 acres of brush and dead wood.
65 rods woven wire fence.
110 fence posts—8 feet long. chestnut.
1,500 cu. yds. grading around head house.
600 " " " at road.

(2) Infiltration Lines:

93' 0"—4" vit. tile—5' trench (earth & boulders).
95' 0"—4" " " —5' " (rock).
350' 0"—3" C. I. pipe, H. & S.
42 cu. yds. stone hammered to small pieces.

495 (3) Head House:

Area of floor 25 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof 176 cu. ft.

11 cu. yds. excavation (earth).
3½ " " concrete in basin.
1—5" x 20" iron screen over outlet box.

1 Frame superstructure bolted to concrete basin—pine anl poplar Frame work 2 x 4's covered with 1" rough sheeting and weather boarding with trim. Roof, dipped and painted shingles, laid on 1" rough sheeting. 1 door made of 2 layers 1" tongue and groove lumber, fitted with 2 strap hinges and Yale lock. Building painted 2 coats outside.

(4) Piping in Head House:

Blow-off (Ave. depth 2 ft.):

9' 0"—4" C. I. pipe, H. & S.
1 —4" gate valve, H. & S.

Overflow:

9' 0"—4" vit. tile.

(*d*) Spring No. 15 (Exhibit No. 12).

This spring is located on the "Henry Bailey" farm. The water comes out of the ground and flows for a short distance on the surface then disappears and comes out in the "Ada' Spring (No. 21). The sink hole has been fenced with a woven wire fence and a ditch has been dug to care for surface drainage. No clearing has been done.

496 Quantities:

24 rods woven wire fence.
40 fence posts 8 feet long (locust).
85 cu. yds. excavation in 380 lin. ft. of ditch.

(e) Spring No. 16 (Exhibits Nos. 12 & 21):

Area of tract 1.058 acres. Land cleared of all brush and dead wood and fenced with a woven wire fence. 1—Concrete head house with a reinforced concrete roof and steel door. Carried material 500 feet.

Spring purchased in 1910—developed in 1912.

Quantities:

(1) Land Improvements:

Clearing 1.058 acres of brush and dead wood.
53½ rods woven wire fence.
88 fence posts 8 feet long, chestnut.
20 cu. yds. grading.

(2) Infiltration Lines:

525' 0"—4" tile, 4' trench (1/3 rock).
117 cu. yds. rock hammered to small pieces.

(3) Head House:

Area of floor 9 sq. ft.
Cubic contents, outside dimensions from bottom of foundation to average height of roof 143 cu. ft.
4 cu. yds. excavation (earth).
2.9 cu. yds. concrete in basin and walls.
0.3 " " reinforced concrete roof slab 4" thick.
150 lbs. ¾" round rods.
1 iron door and frame approx. wt. 90 lbs.
1—5½" x 14" iron screen over outlet box.
1—Hasp and padlock.

497 (4) Piping in head house:

Blow-off:

11' 6"—4" C. I. pipe, H. & S.
1—4" gate Valve, H. & S.

Overflow:

2' 0"—4" vit. tile.

(*f*) Spring No. 17 (Exhibits Nos. 12 & 21).

Area of tract 1.99 acres. Land cleared of brush and dead wood and surrounded by a woven wire fence. 1 Concrete head house at this spring. Carried material 600 feet.
Spring purchased in 1910—developed in 1912.

Quantities:

(1) Land Improvements:

Clearing 1.99 acres of brush and dead wood.
99 rods woven wire fence.
165 fence posts 8 feet long, chestnut.
30 cu. yds. grading.

(2) Infiltration Lines:

440′ 0″—4″ vit. tile 4′ trench (loose rock).
180′ 0″—4″ C. I. pipe H. & S. 4′ trench (loose rock).
98 cu. yds. rock hammered into small pieces.

(3) Head House:

Area of floor 8½ sq. ft.
Cubic content, outside dimensions from bottom of foundation to average height of roof 147 cu. ft.
4 cu. yds. excavation (earth).
2.9 cu. yds. concrete in basin and walls.
0.5 " " " " reinforced roof slab.
180 lbs. ¾″ round rods.
1—iron door and frame—approx. wt. 90 lbs.
1—5″ x 18″ iron screen on outlet box.
1—Hasp and padlock.

498 Quantities:

(4) Piping in head house:

Blow-off (Ave. depth 2′):

17′ 0″—4″ C. I. pipe, H. & S.
1—4″ gate valve, H. & S.

Overflow:

4′ 0″—4″ vit. tile.

(*g*) Spring No. 18 (Exhibits Nos. 12 & 21).

Area of tract 44.99 acres. Approx. 15 acres cleared of brush and dead wood. The tract is partly fenced and contains two concrete head houses. The material had to be carried 800 feet for both houses over a very rocky piece of hillside.
Spring purchased in 1910—developed in 1912.

Quantities:

Clearing 15 acres of brush and dead wood.
255 rods woven wire fence.
420 fence posts 8 ft. long, chestnut.
900 cu. yds. grading.

East Spring (No. 18 A):

(1) Infiltration Lines:

125′ 0″—4″ vit. tile, 5′ trench (rock).
28 cu. yds. rock hammered into small pieces.

(2) Head House:

Area of floor 8 sq. ft.
Cubic contents, outside dimensions from bottom of foundation to average height of roof 131 cu. ft.
2½ cu. yds. excavation (earth).
3 " " concrete in basin and walls.
½ " " " " reinforced roof slab.
140 lbs. ¾″ round rods.
1—iron door and frame, approx. wt. 80 lbs.
1—6½″ x 21″ iron screen over outlet box.
1—Hasp and padlock.

499 (3) Piping in head house:

Blow-off:

12′ 0″—4″ C. I. pipe, H. & S.
1 —4″ gate valve, H. & S.

Overflow.

9′ 0″—6″ C. I. pipe, H. & S.

West Spring (No. 18 B):

(1) Infiltration Lines:

71′ 0″—4″ vit. tile pipe in 5′ trench (rock).
53′ 0″—4″ " " " " 6′ " (½ rock).
200′ 0″—4″ " " " " 10′ " (¾ rock).
200′ 0″—4″ " " " double line in 100′ trench 6′ deep (loose rock).
1,300′ 0″—4″ " " " in 5′ trench (½ rock).
385 cu. yds. rock hammered to small pieces.

(2) Head House:

Area of floor 34 sq. ft.
Cubic contents, outside dimensions from bottom of foundations to average height of roof 485 cu. ft.
7 cu. yds. excavation (earth).
6.5 " " concrete in basin and walls.
1.1 " " reinforced concrete in roof slab.
400 lbs. ¾" round rods.
1—iron door and frame—approx. wt. 160 lbs.
1—7" x 32" iron screen over outlet box.
1—Hasp and padlock.

(3) Piping in Head House:

Blow-off:

5' 0"—8" C. I. pipe, H. & S.
17' 6"—8" vit. tile pipe.
1—8" gate valve.

Overflow:

9' 6"—6" C. I. pipe, H. & S.

500 (*h*) Spring No. 20 (Exhibit No. 12).

Area of tract 0.0578 acres. This spring is located in a pasture and was abondoned after the basin was partially built.

Quantities:

4½ Cu. yds. excavation (earth).
2.4 " " concrete in basin.
1 iron screen 8" x 16" over outlet box.
40' 0"—4" vit. title in 4' trench (earth).

(*i*) Spring No. 21, Ada Spring (Exhibits Nos. 12-22-23*a*-23*b* & 24).

This spring appeared out of the side of a cliff in many small springs which flowed into a swampy hole. The hole was cleared of all muck and the earth removed down to shale. A concrete retaining wall with a spillway was placed on the lower side of the hole and the space behind filled to a depth of 5' with small pieces of rock, which was covered with a foot of shale and a foot of earth and sod. On the cliff side of this basin another retaining wall was built in which 2 pieces of 10" C. I. pipe were placed. When the flow of the springs is too heavy for the filter bed, the excess water either flows over the spillway of the basin or passes out of a concrete cut-off wall at the spring through 3—12" vitrified tile pipe lines. The head house is an elaborate octagonal building with a basin made of concrete surmounted by a shingle roof supported on iron columns and enclosed with heavy wire netting.

501 The spring and filter are enclosed within a woven wire fence and the head house surrounded by evergreen trees. Ditches were built to care for the overflow and surface water. Spring purchased in 1900—developed in 1906-7.

Quantities:

(1) Fencing:

30 rods woven wire fence.
63 fence posts 8 feet long, chestnut.

(2) Basin:

163 cu. yds. excavation (earth).
163 " " " (stone-large boulders).
870 " " " (shale) on hillside.
500 " " " (stone) " "
44½ " " concrete in retaining walls & aprons.
1,630 " " stone hammered to small pieces.
326 " " excavated shale replaced.
326 " " earth replaced.
8,800 sq. ft. sod.
4' 0"—10" C. I. pipe.
12' 0"—12" vit. tile.

(3) Outlet Box from Basin:

3.8 cu. yds. concrete in walls and bottom.
10 bd. ft. in 1—4 x 4 split diagonally (held in corners of box by nails sticking into concrete).
44 lbs. ½" round rods 4' 8" long, 14 in number.
31½ sq. ft. screen 4' 6" x 7' 0"—¼" mesh.
50 bd. ft. 2" oak in cover.
28 lin. ft. 2" quarter round pine.
2 strap hinges.
1 hasp and padlock.

(4) Spring House:

37 cu. yds. excavation.
46 " " concrete.
64 lin. ft. 2" W. I. pipe in posts.
64 " " 1½" " " " "
88 lbs. C. I. in 8 column plates.
320 " ¾" round rods in uprights.

502

16—⅝" round rods 8 ft. long with rings at ends and turnbuckle—approx. wt. 140 lb.
8—cleavises.
56 lin. ft. woven wire net 56" high, made of ⅛" round wire with 1" mesh and ¼" round rods at edges.

1 door and frame 19″ x 20″ made of 1″ x 3/16″ iron riveted and welded with door panel of wire net.
2—12″ x 27″ iron strainers over outlet box.
1—padlock.
600 bd. ft. pine lumber in roof framing d 4 s.
300 " " 1″ sheeting on roof.
230 " " beaded pine ceiling laid in octagon.
70 lin. ft. 3″ x 1″ moulding.
75 " " 2″ moulding.
11 sq. yds. shingles—dipped and painted.

Painting:

All wood and metal above the concrete basin painted two coats.

(5) Piping at Spring House:

Basin to Spring House:

16′ 0″—18″ vit. tile 4′ trench.

In Spring House:

27′ 0″—18″ vit. tile.
1—18″ " " tee.

Caps over 18″ pipes:

2—circular covers, 24″ diameter, made of 2 layers 1″ board with an iron ring 24″ in outside diameter. Ring of 2″ x 3/8″ iron with 12—½″ holes. Each cover held by 12—3/8″ bolts 12″ long embedded in the concrete walls of the basin.

503 (6) Miscellaneous:

181 lin. ft. rough stone wall 4′ high—no mortar.
220 cu. yds. excavation in ditches.
150′ — 2″ W. I. pipe.
43′ —¾″ " " "
17′ —¼″ " " "
1 —bibb cock.
1 —2″—1″ reducer.
1 —1″ globe valve.
13 —evergreen trees set out.
100 —poplar trees " "

(j) Springs No. 22 (Exhibits Nos. 12 & 20).

Area of tract 0.46 acres. Land graded up and the East River moved for 500 feet of its length. 1 frame head house on concrete basin with a concrete retaining wall behind it. A rough uncemented stone wall was placed along the river opposite the head house.
Spring purchased in 1907—developed in 1907.

Quantities.

(1) Land Improvements:

450 cu. yds. grading.
600 " " excavation in new river bed.
100 lin. ft. of loose stone wall 3' high.

(2) Infiltration Lines:

8 cu. yds. concrete cut-off wall 4' high 1' 0" B thick.
2' 0"—8" vit. tile.

(3) Head House:

Area of floor 33 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof 232 cu. ft.
504 7 cu. yds. excavation (earth).
3.2 " concrete in basin.
1—5" x 25" iron screen over outlet box.
1—Frame superstructure bolted to concrete basin—pine and poplar. Frame of 2 x 4s covered with 1" rough sheeting and weather boarding with trim. Roof, dipped and painted shingles laid on 1" rough sheeting. 1 door of 2 layers 1" tongue and groove lumber fitted with 2 strap hinges and a padlock. Building painted 2 coats outside.

(4) Piping in Head House:

Blow-Off:

4' 0"—8" C. I. pipe, H. & S.
10' 0"—8" vit. tile.

Overflow:

38' 0"—6" vit. tile.

Item No. 5. Jarrell Spring, Spring No. 19 (Exhibit No. 25).

This spring is located on an uncleared and unfenced tract of land, 1 acre in extent. No development has been done.

Item No. 6. Beaver Pond Spring, Spring No. 23 (Exhibits Nos. 12-26 & 55).

Area of tract 1 acre. No clearing was required at this spring.

Quantities:

(1) Land Improvements:

47 rods woven wire fence.
94 fence posts 8′ long—chestnut.
300 bd. ft. lumber in 150′—3 board fence.
230 lin. ft. rip rap stone wall, 3′ high.

505 Item No. 7. Reservoir and Dam (Exhibit No. 27).

The reservoir was built to retain the excess water flowing from the Ada Spring during the wet season and save it for times when the demand would exceed the flow of the spring. The valley through which the pipe line runs from the spring to the pumping station was dammed with a stone and timber dam and the basin above cleared of all surface soil.

The dam is 150 feet long by 30 feet high in the center. It is built of large logs laid in 10′ x 10′ cribs securely spiked and bolted together. The upper face is covered with two layers of 2″ plank against which earth has been banked. There is a 20 ft. spillway made of plank set two feet below the level of the top of the dam. The cribbing is filled with loose stone and slate. A 36″ C. I. blow-off pipe is placed through the dam.

In the construction of the reservoir, it was necessary to relocate the road and ditch along the side of the hill to intercept run off water as well as carry the surface drainage from the valley above the reservoir.

The dam and reservoir were built in 1902 and abandoned in 1909. It is now in bad repair.

Item No. 8. Pipe Line from Gravity Springs to City (Exhibits Nos. 29 & 28).

This line of pipe begins at Adams Street near Jefferson Street and runs through a ravine to a point north of Fairmont Street where it forks. One branch leads to Spring No. 1, one to Spring No. 2 and the other runs east along the Cumberland Gap Road and up
506 the side of East River Mountain to Spring No. 11. This latter branch acts as a collecting main for Springs Nos. 3 to 10 inclusive, which are connected to it by short lines running down from the Spring houses.

More or less difficulty was encountered in the laying of these lines due to rock and shale in the trenches. Hauling and distributing the pipe was *was* a large item on these lines, as the main road is extremely rough and rocky with excessive grades which limit an average wagon load to 2,000 lbs. Most of the pipe for the lateral branches, which run up the mountainside, were even more difficult to distribute, a great deal of it having to be carried by hand.

(*a*) Cast Iron Pipe.

12,133 lin. ft. 6″ C. I. pipe Class B.
10,336 " " 4″ " " " "
3,652 " " 4″ " " " "
Weight 343.8 tons.

NOTE.—1,910 lin. ft. of 3″ and 2,300 lin. ft. of 4″ are relaid pipe.

Cast Iron Specials on the Above Pipe:

1—6″ x 6″ x 6″ tee.
6—6″ x 6″ x 6″ Y-branches.
7—4″ x 4″ x 4″ "
4—6″ to 4″ reducers.
6—4″ to 3″ "
2—6″ sleeves.
11—4″ "
8—3″ "
Weight of above specials 3,787 lbs.

Valves:

4—6″ Double Gate Valves.
13—4″ " " "
4—4″ Check valves.

507 (*b*) Laying the Pipe Lines.

Ordinary trenching including excavation, laying, yarn, lead and backfill. All pipe having 2 ft. of cover.

The excavation was made difficult and expensive by the presence of a great many boulders and thin rock ledges as well as the distance from town at which some of the work was carried on.

12,133 lin. ft. of 6″ pipe.
10,336 " " 4″ "
3,652 " " 3″ "

(*c*) Extra for Unusual Excavation.

Over and above the cost of ordinary trenching.

Solid Rock Trenches:

The trenches lie through solid limestone which is very hard and brittle, making drilling and blasting expensive. The strata lie in an almost vertical plane.

708 cu. yds. rock excavation.

Shale Trenches.

The shale is extremely tough and lying in a nearly vertical plane it is impossible to blast while picking is very slow work.

1,530 lin. ft. shale trench.

Item No. 9. Pipe Line from Ada Springs to City (Exhibits Nos. 12, 28 & 30).

The pipe included in this item consists of the lines from the springs to the road, the gathering line along the road, the line to the Ada Pumping Station and the force main from the station to the city at Market Street.

The pipes for the Spring lines run up the side of the mountain and were extremely hard to distribute, while the excavation was through rock and large boulders for a great part of the way.
508 The gathering line along the road was about half in rock.
The line from the Spring to the Ada Station was the most expensive piece of construction on the entire system. This pipe follows a ravine from the Ada Spring to the railroad. As a creek also runs in this ravine, a great deal of water worked into the trenches. The first half of the line lies through shale and the remainder through solid rock. Distributing the pipe entered into the extra cost as it had to be hauled from Ada over a rough and rocky path; a road was even built for a large part of the distance. From the railroad to the Pumping Station the line follows the East River and the tracks. It crossed the river 8 times and under the railroad twice—both of these latter crossings are through long masonry culverts 25 ft. wide by 100 ft. long. A great deal of rock and water was also encountered on this line. For a distance of 700 feet the pipe lies along a steep hillside. Here it was necessary to pull the pipe up from the creek bed by ropes, the slopes being so steep that a person could walk only with difficulty. The force main to the City parallels the railroad and follows up the East river. Little rock was encountered and only a few wet spots.

(*a*) Cast Iron Pipe.

11,400	lin.	ft.	10″	C.	I.	pipe	@	63.8	lbs. per ft.
2,570	"	"	10″	"	"		@	76.7	" " "
7,600	"	"	10″	"	"		@	88.5	" " "
9,401	"	"	8″	"	"		@	47.5	" " "
2,943	"	"	6″	"	"		@	33.3	" " "
2,055	"	"	4″	"	"		@	21.7	" " "
7,094	"	"	3″	"	"		@	16.2	" " "

Weight of the above pipe 1,150.4 tons.

NOTE.—6,864 lin. ft. of 3″ and 2,055 lin. ft. of 4″ pipe in the above are relaid pipe.

509 Cast Iron Specials:

1—10″ x 10″ x 10″ Y—Branch.
2—10″ x 10″ x 6″ "
2— 8″ x 8″ x 8″ "
3— 8″ x 8″ x 6″ "
1— 8″ x 8″ x 4″ "
1— 6″ x 6″ x 6″ "
2— 4″ x 4″ x 4″ "

5—10″ x 10″ x 6″ tees.
1— 6″ x 6″ x 6″ "
2— 4″ x 4″ x 4″ "

2—10″—90° bends.
5—10″—45° "
3— 6″— " "
2— 4″— " "
9— 3″— " "
1—10″—22½° "

74— 3″ sleeves.
8— 4″ "
3— 6″ "
4— 8″ "
2—10″ "

1—10″ to 8″ reducer.
7— 6″ to 4″ "
6— 4″ to 3″ "

Weight of above specials 13,334 lbs.

Valves:

8— 4″ Double Gate Valves.
9— 6″ " " "
1— 8″ " " "
1—10″ " " "
1— 6″ Horizontal Check Valve.
2—10″ " " "

(*b*) Laying Pipe Line.

Ordinary trenching including excavation, laying yarn, lead and backfill. All pipe having 2 ft. of cover.

21,570 lin. ft. 10″ pipe.
9,401 " " 8″ "
2,943 " " 6″ "
2,055 " " 4″ "
7,094 " " 3″ "

43,063 lin. ft. cast iron pipe in place.

510 (c) Extra for Unusual Excavation.

Over and above the cost of ordinary trenching.

Rock Trenches:

These trenches lie through solid limestone ledges which have been turned so that their stratification lies almost vertically.

3,065 cu. yds. rock excavation.

Shale Trenches:

The shale encountered was very difficult to excavate owing to its lying in vertical planes and having to be picked out. Most of the shale trenches were more or less wet.

4,200 lin. ft. shale trenches.

Wet Trenches:

Constant pumping or bailing required.

6,400 lin. ft. wet trenches.

Steep Hillside Trench:

700 lin. ft. trench.

(d) Miscellaneous Crossings.

6 stream crossings—river averages 10 ft. wide by 1½ ft. deep. 3 of these crossings are in rock and 1 in hard, blue shale.

River and Railroad Crossings:

Where the pipe passes through the railroad fill, it lies, along with the river, in a masonry culvert 25 feet in width and 100 feet long. The excavation is through solid rock. Small shots had to be used in order to prevent damage being done to the culvert while the water of the river was a serious item to content with.

2 of the above crossings.

511 Item No. 10. Pipe Line from Beaver Pond to City (Exhibit No. 12).

This line begins at Walton Street and runs to the Beaver Pond Pumping Station which is located at Spring No. 23. The pipe line runs through the fields under 2 feet of cover.

(*a*) Cast Iron Pipe.

1,740 lin. ft. 10″ C. I. pipe @ 56 lbs. per ft.
1,700 " " 10″ " " @ 60 " " "

Total weight 99.7 tons.

(*b*) Laying the Pipe Line.

Ordinary trenching including excavation, laying, yarn, lead and backfill. All pipe under 2 feet of cover. This pipe line lies through fields which are accessible with teams and light loads.

Laying 3,440 lin. ft. C. I. pipe.

(*c*) Extra for Unusual Excavation.

Over and above the cost of ordinary trenching Solid Rock.
Two ledges of solid limestone were encountered which were extremely hard.
155 cu. yds. rock excavation.

511*a* *The Pumping Stations.*

511*b* The Ada Pumping Station.

512 Item No. 11. The Ada Station Building (Exhibits Nos. 31-38 incl.):

(*a*) The Building.

The original pumping station was built in 1900 and consisted of a rough frame structure 25′ x 35′ x 10′ with an asbestos paper roof, housing two boilers and a Worthington duplex pump of 1.5 million gallon capacity.

In 1906 the present station was erected around the old, and all but the pumping engine of the former station removed. The new station is of concrete block construction laid in Portland cement mortar, resting on a concrete foundation. The roof is of tile supported on 2″ sheathing laid upon steel trusses. Space had to be blasted out of the rock to make room for the station. About one-third of the building sits on this rock ledge while the remainder is on deep foundations passing through clay and muck deposited by the East River Branch of New River. Bracing was required for all of the trench excavation. The floor of the present station was placed 4 feet higher than the old one and the station grounds brought up to this grade.

Cubical contents, outside dimensions from average bottom of footings to average height of roof—223,500 cu. ft.

513 (1) Excavation:

Rock on ledge included in station ground improvements.
North Wall—none.

East wall	(0′ 14′ deep)	40	cu. yds.	bracing required.
South "	(8′ 14′ ")	216	"	" "
West "	(0′ 8′ ")	28	"	" "
Partition wall	(0′ 11′ ")	47	"	" "
Coal bin partition	none	0		
Tool room partition	none	0		
Total		331	cu. yds.	" "

(2) Foundations to Floor Line:

264 cu. yds. concrete.

(3) Walls:

The walls are made of two rows of cement blocks outside rock faced, inside smooth, set in red Portland cement mortar with the following exceptions.

Concrete wall 5′ 6″ high along north wall of pump room.
" " 6′ 8″ " " " " " tool "
" " 6′ 8″ " " " " " coal bins.
" " 6′ 8″ " " east " " tool room.
" " 6′ 8″ " " " " " coal bin.*
" " 7′ 4″ " " south " " " "
15″ brick wall on boiler room partition in ventilator.
Openings included in outside walls.
76 cu. yds. concrete in walls (2′ thick).
2,900 common brick (red) set in Portland cement mortar.
4,138 sq. ft. of 15″ cement block wall, openings included.
4,544 " " 20″ " " " " "
112 " " 10″ " " " " "
130 iron wall stays 2½″ x ¼″ x 10″

(4) Structural Steel in Roof Trusses:

5 Pratt trusses 51′ 5″ span. 13′ 0″ high with ventilator and lateral bracing.
514 Total weight—52,000 lbs.

(5) Lumber in Roof and Ventilator:

14,089 bd. ft. poplar in joists, purlins & framing.
14,750 bd. ft. No. 1 common dressed poplar in sheathing.
1,243 bd. ft. #1 poplar—dressed—in ventilator.
1,430 bd. ft. 3″ x 6″ #1 poplar in Jack rafters.
1,120 lin. ft. 2½″ x 3″ poplar moulding.

*This wall is faced on the outside with one row of cement blocks.

(6) Roofing and Gutters:

6,420 sq. ft. 6½″ x 13″ x ½″ flat tile roofing with copper nails.
113 lin. ft. fancy tile ridge row.
1,050 sq. ft. galv. iron gutter and flashing.
320 bd. ft. #1 poplar in gutter.

(7) Downspouts:

154 lin. ft. 4″ corrugated downspouts 20 90° bends.

(8) Painting:

All exterior wood and metal work painted two coats.

(*b*) Engine Room.

Area of floor—2,940 sq. ft.

(1) Floor:

2,000 sq. ft. of 8″ concrete floor laid on 18″ of cinders.
1½″ top coat of 1:2 Portland cement sand.
6½″ base of 1:3:5 Portland cement, sand and stone.

(2) Interior Trim:

Oak wainscoting 6′ 0″ high, 216 lin. ft. containing:
1,950 bd. ft. dressed oak lumber.
216 lin. ft. 1 x 5 cap with 1 edge rounded.
216 " 2″ x 2″ moulding.

515 (3) Doors and Windows:

Window sashes and outside of frame white pine, inside of frame, oak. Doors, oak inside finish, frames white pine.

1 pair outside sliding doors 10′ x 14′ with 20 10″ x 15″ lights 1⅜″ sash in top of each piece door, one piece door has wicket door hung with hinges 2′ 10″ x 5′ 2″. This pair of doors shows segmental top outside (rad. 10′ 0″) and square inside, and is hung on McCabe door hangers.

1 inside door and frame 3′ 4″ x 10′ 0″ to segment (rad. 3′ 4″) with 10″ x 15″ C light pivot transom. Size of door 3′ 0″ x 6′ 6″.

1 Inside door and frame 3′ 4″ x 7′ 4″ to segment (rad. 3′ 4″).

4 twin windows, frames, weights and cords for 15″ wall. Top sashes segmental (radius 6′ 9″). Opening 6′ 9″ x 10′ 0″. 4 sashes of 12—10″ x 15″ lights each.

2 twin windows, frames, weights and cords for 20″ wall. Top sashes segmental (radius 6′ 9″) 10″ x 15″ lights each.

1 twin window, frame, weights and cords for 20″ wall. Opening 5′ 4″ x 6′ 9″. 2 sashes rabbetted to pivots—segmental top (rad. 6′ 9″) with 12—10″ x 15″ lights each.

1 single window and frame—fixed for 20″ wall. Opening 5′ 4″ x 4′ 1″. Segmental top (rad. 4′ 1″) 1 sash with 16—10″ x 15″ lights.

(4) Painting and Varnishing:

Inside walls painted two coats white and the joints between the blocks outlined in red.

Roof truss and underside of sheeting painted two coats graphite paint.

5,100 sq. ft. wall painted 2 coats.
3,700 sq. ft. roof sheeting painted 2 coats.

516 Woodwork filled and varnished with two coats varnish.

(c) Boiler Room.

Area of floor—1,310 sq. ft.

(1) Floor:

750 sq. ft. of 8″ concrete floor laid on.
18″ of cinders.
1½″ top coat of 1:2 Portland cement & sand.
6½″ base of 1:3:5 " " sand & stone.

(2) Doors and Windows:

All frames and sashes of white pine.

1 pair outside sliding doors 10′ x 14′ with 20—10″ x 15″ lights, 1¾″ sashes in the top of each piece door. One door has wicket door hung with hinges 2′ 10″ x 5′ 2″. This pair of doors shows segmental top outside (rad. 10′ 0″) and square inside, and is hung on McCabe door hangers.

3 twin windows; frames, weights and cords for 15″ wall. Top sashes segmental (rad. 6′ 9″). Opening 6′ 9″ x 10′ 0″. 4 sashes of 12—10″ x 15″ lights, each.

1 twin window; frame, weights and cords for 20″ wall. Top sashes segmental (rad. 6′ 9″). Opening 6′ 9″ x 10′ 0″. 4 sashes of 12—10″ x 15″ lights.

3 twin windows and frames for 20″ wall. 2 sashes rabbetted to pivots. Segmental top. (radius 6′ 9″) with 12—10″ x 15″ lights sashes. Opening 5′ 4″ x 6′ 9″.

5 single windows and frames for 15″ wall. Sash rabbetted to pivots, segmental top (rad. 4′ 1″) 8—10″ x 15″ lights. Opening 2′ 9″ x 4′ 1″.

517 (3) Painting:

Roof trusses painted two coats graphite paint.
Window frames and doors unpainted.

(4) Miscellaneous:

4—3″ x 3″ x 4.8# —3′ 6″ long angles bolted to coal bin opening—Wt. 67 lbs.

(*d*) Coal Bin.

Cubical contents—net—6,250 cu. ft.
Area of floor—500 sq. ft.

(1) Floor:

500 sq. ft. 8″ concrete floor.
1½″ top coat of 1:2 Portland cement & sand.
6½″ base " 1:3:5 " " sand and rock.

(2) Roof:

2—6″—12.25# I beams 18′ long.
5—5″ x 3″ x 8.2# angles, 36′ 7″ long.
8—6″ x 6″ x 14.9# " 0′ 8″ "

Total weight of steel = 2,000 lbs.

680 bd. ft. 1″ sheathing, poplar.
35½ lin. ft. 10″ x ⅞″ dressed poplar trim.
35½ " 2″ x 2″ moulding.
35½ " 4″ x 1″ cap.
76 squares tar paper.

(3) Painting:

Trim on roof painted two coats.

(*e*) Tool Room.

Cubic contents—net—1,400 cu. ft.
Area of floor—112 sq. ft.

(1) Floor:

112 sq. ft. 8″ concrete floor.
1½″ top coat of 1:2 Portland cement and sand.
6½″ base of 1:3:5 " " sand and stone.

518 (2) Roof:

5—5″ x 3″ x 8.2# angles 8′ 3″ long, weight 340 lbs.
157 bd. ft. 1″ sheathing, poplar.
8¼ lin. ft. 10″ x ⅞″ dressed poplar trim.
8¼ " 2″ x 2″ moulding.
17½ sq. yds. tar paper.

(3) Shelving:

104 bd. ft. ⅞″ dressed poplar shelving.

(4) Painting:

Shelving and trim on roof painted two coats.
Concrete walls painted two coats.
Door and window frame filled and varnished.
750 sq. ft. walls & shelves painted two coats.

Item No. 12. Steel Stack (Exhibit- No-. 32-36-37 & 39).

The stack is of the self-supporting type set on a massive concrete foundation. It is 4′ 0″ in inside diameter and lined to the top with fire brick. The excavation was carried down to rock (16 feet) through muck.

(*a*) Excavation.

187 cu. yds. of muck excavation 16 ft. deep bracing required.

(*b*) Foundation.

90 cu. yds. mass concrete containing large boulders.
41 cu. yds. concrete (forms required).
2,700 fire brick.
2 tons fire clay.
1—C. I. clean-out door and frame, 20″ x 30″ opening. Approximate weight 400 lbs.
1—C. I. chimney pit cover and frame, 3′ 10½″ x 4′ 10½″ opening. Approximate weight 770 lbs.

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(*c*) Stack.

1 steel stack 100′ 0″ high x 4′ 0″ diameter. Steel plates are under the following specifications: Open hearth steel, ultimate tensile strength 55,000 to 65,000 lbs. per square inch, elastic limit not less than ½ the ultimate strength. Minimum elongation 25% in 8 inches, phosphorus not to exceed 0.06% and sulphur not to exceed 0.04%. Test pieces shall bend flat on themselves without sign of fracture either when bent cold or after being heated to cherry red and plunged into water at 80° F.

Cast iron—neutral, soft, tough gray iron.

Total weight of steel in stack	21,500	lbs.
Weight of C. I. base & 6 anchor plates	7,500	"
" " 6 anchor bolts	550	"

9,500 circle fire brick in lining.
1,400 common red brick in lining.
2 tons of fire clay in lining.

Item No. 13. Coal Chute (Exhibits Nos. 32 & 37).

The coal chute is a concrete structure consisting of a hopper under a switch track of the railroad and an enclosed chute to the coal bin through which the coal is delivered by gravity. No excavation was required. The roof of the chute is reinforced with 1¼" rods and two layers wire fencing.

Quantities:

62 cu. yds. concrete in walls and roof.
2,004 lbs. 1¼ round rods (35—14 ft. long) in roof.
127 sq. yds. woven wire fence in roof.

Item No. 14. Oil House (Exhibit No. 40).

Made of concrete blocks laid in red Portland cement mortar 1:3 with reinforced concrete roof. Built in 1907.
520 Cubic contents from bottom of footings to average height of roof, outside dimensions—611 cu. ft.
Area of floor—61 sq. ft.

(*a*) Foundation.

3 cu. yds. concrete.

(*b*) Walls.

213 sq. ft. 8" concrete block wall.
1/3 cu. yds. concrete in end walls.

(*c*) Roof.

2.7 cu. yds. reinforced concrete arch roof 8" thick.
383 lbs. ¾" round rods.
270 sq. ft. woven wire fencing.

(*d*) Floor.

Cinders.

(*e*) Door.

1 3′ 0" x 7′ 0" door and frame 3′ 4" x 7′ 4" Top to segment. Door oak finished on one side. (Same as inside door in pumping station.) Unpainted.

Item No. 15. The Worthington Pump (Exhibit No. 41).

(*a*) Pumping Engine.

1 Worthington double acting horizontal duplex pumping engine of 1.5 million gallon capacity.

Diameter of steam cylinders—20 inches.
" " plungers 15 "
Length of stroke 10¼ "
Built in 1900.
This pump is not operated any more but is kept only for emergency use.

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(*b*) Foundation.

10 cu. yds. excavation—earth.
8 " " stone masonry laid in Portland cement.
1—4′ 3″ x 9′ 10″ x ½″ iron plate bolted on top of foundation with 4—1″ anchor bolts 4′ long. Approximate weight of plate—850 lbs.

(*c*) Concrete Pit.

4 ft. deep with 10″ walls on three sides.
One end is formed by building foundation while the other contains 4 concrete steps.
10½ cu. yds. concrete including 4 steps.

(*d*) Suction and Discharge Piping.

8 1/3 ft. 10″ W. I. screw pipe.
2—10″ ex. heavy fl. coupling.
7 ft. 8″ " " W. I. screw pipe.
2—8″ ex. heavy fl. coupling.

Item No. 16. The Snow Pump (Exhibits Nos. 32 & 42).

(*a*) Pumping Engine.

1 horizontal cross-compound high duty crank and fly-wheel condensing pumping engine of a rated capacity of 1.5 million U. S. gallons of water per 24 hours against a total water pressure including suction lift of 305 lbs. per square inch. The valve motion is of the Corliss type. 4 Single acting outside-packed plungers.

Steam pressure,
Piston speed at rated capacity, 220 ft. or 36 2/3 rev.
Diameter of H. P. steam cylinder, 18 inches.
" " L. P. " " 40 "
" " plungers, 7¾ "
Common stroke, 36 "
Diameter of fly-wheel, 12 feet.
Weight of fly-wheel, 16,000 lbs.
Guaranteed duty, 135 million ft. lbs. per 1,000 lbs. of steam.

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The installation includes the main pumping engine.

522 1 500 sq. ft. surface condenser; 1 6″ x 8″ x 7″ rotary dry vacuum pump. Blake straight line pattern; 1 4½″ x 3¾″ x 4″ duplex wet vacuum pump; 2 air pumps; 4 air chambers; 1 3″ x 2″ x 3″ Duplex jacket pump; 1 reheating receiver, automatic air valves; delivery relief and by-pass valve; and all interior piping, valves and traps for connecting these parts with each other and with the engine inside of their common nozzles. The interior piping includes all piping from and including the throttle valve on the steam end to and including the breeching Y on the suction and discharge end. Gauges, oilers, revolution counters, lubricator and other accessories included with this type of pumping engine are furnished. Erected in 1906.

(*b*) Foundations.

63 cu. yds. rock excavation.
34 " " earth "
114 " " concrete "

(*c*) Suction and Discharge Piping.

6′ 0″—10″ C. I. fl. pipe (ex. heavy)	approx. wt.,	600 lbs.
21′ 6″—12″ " pipe flanged	" "	1,650 "
1—12″ fl. ⅛ bend	" "	238 "
1—12″ " Y	" "	780 "

2—12″ " Eddy gate valves.
1—10″ " gate valve with by-pass attached (Heavy).
1—10″ " check valve (Chapman) with ¾″ pipe by-pass (heavy) made of the following:
2′—¾″ W. I. screw pipe, ex. heavy.
2 —¾″ ells " "
1 —¾″ union " "
1 —¾″ globe valve.

523 Item No. 17. Auxiliaries (Not Included with Pumping Engines). (Exhibit No. 43.)

(*a*) Feed Water Pump.

1 Epping Carpenter #6772 duplex steam pump 5¼″x 3½″ x 5″. This pump takes its suction from the hot water tank.

(*b*) Feed Water Heaters.

(1) Worthington Pump Heater:

Vertical heater 4′ 10″ high and 2′ 8″ in diameter. Supported by three iron legs.

(*a*) Foundation:

2½ cu. yds. excavation.
2— " " concrete.
3—C. I. legs. Approx. weight 135 lbs.

(*b*) Fittings:

2′ 0″—1½″ extra heavy W. I. screw pipe.
1 —1½″ " " tee.
1 —1½″ " " elbow.
1 —1½″—1¼″ bushing.
1 —1½″— ¾″ "
1 — ¾″ brass safety valve.

(2) Secondary Heater:

1 Wheeler feed water heater. This feed water heater is supplied with steam from the exhausts of the auxiliary pumps.

(*c*) Oil Separator and Tank:

1 Cochrane 14″ horizontal vacuum oil separator (Fig. 21 in catalog).
1 steel tank 6′ 6″ long—20″ diameter resting on floor.

Fittings:

3′ 0″—1½″ ex. heavy W. I. screw pipe.
6′ 0″—1″ " " " " "
1 —1½″ " " flanged union,
1 —1″ " " " "
1 —1½″ " " 45° bend.
2 —1″ " " elbows
1 —1½″ gate valve.
1 —1″ " "

524 (*d*) Hot Water Tank.

1 vertical steel tank 8′ 0″ high x 2′ 0″ diameter. All water from steam lines, traps and condensed water pumped by wet vacuum and jacket pumps are collected here, and any deficiency in the amount needed by the boiler feed pump is made up by fresh water added to the tank by means of an automatic regulator.

(*e*) Steam Separator.

1 4″ separator on Snow pump.

Item No. 18. Boiler Plant (Exhibits Nos. 32 & 44).

(*a*) 1 Battery containing two Sterling 148 H. P. boilers. Each boiler has 1,477 sq. ft. of submerged heating surface and 35.7 sq. ft.

of grate surface. Grates are 6′ 6″ deep. One is equipped "Sterling Style A" grate bars and the other with McNaughton rocker grates. There are three steam drums 36″ diameter and 8′ 3″ long and one mud drum 42″ diameter and 6′ 10″ long in each boiler. The thickness of the drum plates are as follows:

Steam drums—tube plates		9/16″
	other "	⅜″
Manhole heads		¾″
Blank heads		½″

The plates are of open hearth flange steel with a tensile strength of 54,000 to 62,000 lbs. per square inch.

Boilers designed for 150# operating pressure and tested to 225# hydrostatic pressure.

Built and erected in 1906.

Fixtures:

Each boiler is furnished with cast iron front with flues, doors, grates, etc. complete. (Note.) One set of grates was replaced by McNaughton rocker grates in 1913.

525 Fittings on Each Boiler (Extra heavy flanged):

1 5″ flanged elbow.
1 12″ diameter steam gauge.
1 ¾″ stop valve on steam hose connection.
2 Consolidated pop safety valves.
1 Reliance water column with water gauge, quick closing valves for shutting off water glass and operated from floor level, 3 gauge cocks with lifting handles, blow-off valve and drain pipe from water column terminating in ash pit, all pipes, fittings and brackets necessary for attaching the column to the boiler.

(*b*) Miscellaneous Piping on Both Boilers.

Water columns, interior feed pipes, etc.

5′ 0″—3″ W. I. screw pipe, extra heavy.
10′ 0″—2½″ " " " " "
19′ 0″—1½″ " " " " "
45′ 0″—¾″ " " " " "
6′ 0″—½″ " " " " "
15′ 0″—¼″ " " " " "
4—1½″ tees " "
2—¾″ " " "
2—¼″ " " "
2—2½″ elbows " "
2—1½″ " " "
12—¾″ " " "
6—¼″ " " "
4—¾″ 45° bends " "
2—¾″ unions " "
2—2½″—1½″ bushing " "
2—1½″—¾″ bushing " "
4—1½″ plugs.
2—1½″ flange unions.
2—¾″ globe valves, Chapman.
4—¾″ " " "
2—¼″ " " "
2—1½″ " " "

(*c*) Boiler Blow-off Pipes for Both Boilers.

Blow-off pipe:

26′ 0″— 3″ W. I. screw pipe, extra heavy.
48′ 0″—2½″ " " " " "
1—3″ tee.
4—2½″ "
7—2½″ elbows.
2—3″—2″ bushings.
2—2½″ blow-off valves.

526 Safety Valve Vent:

76′ 0″—3″ W. I. screw pipe.
4—3″ elbows.

(*d*) Boiler Settings.

The two boilers are built in one setting and supported on steel framework resting on the foundations. The walls are made of hard red brick laid in Portland cement mortar, with a lining of fire brick. These walls do not carry any of the boiler weight.

The setting is securely tied together by the steelwork of the boiler frame and additional tie rods and C. I. stiffeners.

Quantities:

*170 cu. yds. earth excavation in trenches.
*142 " concrete.
61 sq. ft. 8" concrete-floor in ash pit.
49,400 common red brick in Portland cement mortar.
16,300 fire brick.
6 tons fire clay.

(e) Smoke Flue.

Concrete tunnel lined with fire brick lying under floor along south wall of boiler room. Openings to extra boiler foundations bricked.

Quantities:

60 cu. yds. earth excavation.
6.7 cu. yds. concrete in walls and roof.
7,000 fire brick.
1—C. I. clean-out door and frame approximate weight 1,400 lbs.
2—tons fire clay.

527 Item No. 19. All Piping in Station.

(a) Hot Water Pipes.

All pipe to carry feed water from the boiler feed pump and Worthington heater to the boilers. Asbestos covered.

114'—1½" extra heavy W. I. screw pipe (asbestos covered).
74'—2" " " " " " " " "
2—1½" " " tees.
1—2" " " "
9—1½" " " elbows.
12—2" " " "
1—2" " " 45° bend.
2—1½" " " flanged union.
1—2" " " " "
1—2" plug.
2—2"—1½" bushings.
3—1½" globe valves.
1—2" flanged gate valve (all brass).
1—1½" check valve, brass with companion flange.

*Includes foundation for an additional battery of 2—148 H. P. boilers.

(*b*) Miscellaneous Water Pipes.

All station supply water pipe, supply pipe for heaters and fresh water supply for boiler feed tank (hot water tank); also piping to water packets on dry vacuum pump and jacket pump.

59′ 0″—2″ extra heavy W. I. screw pipe.
32′ 0″—1½″ " " " " "
101′ 0″—1″ " " " " "
20′ 0″—½″ " " " " "
4—2″ " " tees.
1—1½″ " " "
8—1″ " " "
2—½″ " " "
5—2″ " " elbows.
2—1½″ " " "
12—1″ " " "
5—½″ " " "
3—2″ " " flanged unions.
2—½″ " " unions.
5—2″ " " 45° bends.
1—2″ " " cross.
1—2″—1¼″ bushing.
1—2″—1″ "
3—1″—½″ "
1—2″ plug.

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4—1″ plug.
2—½″ "
1—2″ check valve.
1—2″ gate "
4—2″ flanged gate valve.
1—1¼″ " " " (brass).
4—1″ globe valves (2 Chapman).
2—½″ " "
1—1½″ flanged globe valve (Chapman outside racked).
1—2″ Foster #56019 flanged pressure regulator.
1—1½″ pressure regulator.
1—2″ plug valve.
1—1″ " "
1—ball cock, box and float.
1—2″ flange relief valve—brass, angle outlet-Lunkenheimer.

(*c*) Steam Piping in Station.

Main Steam Header and Header for Auxiliaries:

Includes all steam piping in the two headers to the connections to the boilers. Asbestos covered.

21′ 0″—8″ Extra heavy W. I. screw pipe (asbestos covered).
12′ 0″—5″ " " " " " " " "
33′ 0″—2″ " " " " " " " "
33′ 8″—1½″ " " " " " " " "
2—8 x 5 " " flanged tees.
1—8 x 2 " " " "
1—8 x 1 " " " "
1—2″ " " tee.
7—1½″ " " "
1—2″ " " elbow.
2—1½″ " " "
3—8″ " " flanged couplings.
2—5″ " " " "
2—1½″ " " " "
1—2″—1½″ bushing.
1—1½″ plug.
4—5″ flanged globe valves.
1—2″ " " " (brass).

Steam Line to Snow Pump:

19′ 0″—4″ Extra heavy W. I. Pipe containing 1 90° bend (asb. cov.)
1—4″ " " flanged couplings.
1—4″ flanged globe valve.

529 Steam Line to Worthington Pump:

15′ 6″— 5″ Extra Heavy W. I. screw pipe.
53′ 0″— 4″ " " " " " " (containing 1 90° bend.)
2 — 5″ " " elbow.
1 — 4″ " " "
1 — 4″ " " flanged elbow.
1 — 5″ " " " unions.
3 — 4″ " " " "
1 — 8″ 4″ reducing flange.
1 — 4″ flanged globe valve— Chapman, outside packed.
1 — 4″ " " " " solid brass.
3′ 6″—¼″ W. I. screw pipe.
2 —¼″ globe valves.
1 — 1 pt. lubricator.

Auxiliary Exhaust Header:

This pipe collects the exhaust steam from the auxiliaries and conducts it to the secondary feed water heater.

25′ 0″—3″ Extra heavy W. I. screw pipe.
17′ 0″—2″ " " " " "
5 —3″ " " tees.
4 —2″ " " "
1 —3″ " " elbow.
1 —3″ " " flanged union.
1 —3″—2″ bushing.
2 —3″ globe valves.

Steam Exhaust & Misc. Piping for Boiler Feed Pump:

2′ 0″—2½″ W. I. screw pipe.
8′ 0″—1¼″ " " " "
16′ 0″— ¾″ " " " " extra heavy.
4′ 0″— ¼″ " " " " " "
2 —1¼″ elbows.
1 —1¼″ flanged union.
1 —2 ″—1¼″ bushing.
2 — ¾″ elbows—extra heavy.
1 — ¾″ flanged coupling.
1 —2½″ gate valve.
1 — ¾″ globe " Chapman.
2 — ¼″ " "
1 — ½ pint lubricator.

Steam Exhaust & Misc. Piping to Wet Vacuum Pump:

22′ 0″—1½″ W. I. screw pipe.
10′ 0″— ¾″ " " "
22′ 0″— ½″ " " " extra heavy.

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2 —1½″ elbows.
1 — ¾″ "
8 — ½″ " extra heavy.
1 —1½″ flanged union.
1 — ¾″ union.
2 — ½″ " extra heavy.
1 — ¼″ flanged coupling extra heavy.
1 — ¾″ tee.
1 — 2″—¾″ bushing.
1 —1½″ check valve.
3 — ½″ globe valves.
1 — ½″ oil cup.

Steam Exhaust & Misc. Piping to Dry Vacuum Pump:

7′ 0″—1¼″ W. I. screw pipe.
13′ 0″—1 ″ “ “ “ extra heavy.
1 —1¼″ elbow.
2 —1 ″ “ extra heavy.
1 —1¼″ flanged coupling.
1 —1 ″ “ “ extra heavy.
1 —3 ″—1¼″ bushing.

Steam Exhaust & Misc. Piping to Jacket Pump:

8′ 0″— 1″ W. I. screw pipe.
33′ 0″—½″ “ “ “ extra heavy.
1 — 1″ elbow.
5 —½″ “ extra heavy.
1 — 1″ union.
1 —½″ “ “ “
2 — 1″ flanged couplings.
1 — 1″ check valve.

Exhaust Piping to Air Pumps:

4′ 0″—1½″ W. I. screw pipe.
9′ 0″—1¼″ “ “ “
1 —1½″ tee.
3 —1¼″ elbows.
1 —2 ″—1½″ bushing.
2 —1½″—1¼″ “

Miscellaneous Steam and Exhaust Piping:

Includes drains from lines, heating coil for oil filter and
531 blow out pipe for oil tank.

15' 0"—1¼" W. I. screw pipe.
65' 0"—1 " " " "
32' 0"— ¾" " " "
0' 6"— ¼" " " "
2 —1¼" tees.
1 —1 " "
1 — ¾" "
1 —1¼" elbow.
4 —1 " "
8 — ¾" "
1 — ¼" "
1 —1¼" union.
3 —1 " flanged unions.
1 —1 " union.
5 — ¾" "
8 —1 " 45° bends.
5 — ¾" 45° "
2 —2½"— 1" bushing.
1 —1¼"—¾" "
1 —1¼"— 1" "
1 —1 "—¾" "
1 — ¾" safety valve.
1 — ¼" pet cock.
2 —1 " globe valves—Chapman.
1 — ¾" " "
1 — ¾" " " —outside packed.
1 —McDaniels Pressure Trap.
1 —#2 Wright " "

Radiator in Engine Room:

400' 0"—1" W. I. screw pipe extra heavy.
19 —1" return bends.
3 —1" tees.
2 —1" elbows.
2 —1" unions.
1 —1½"—1" bushing.
1 —1" globe valve—Chapman, outside packed.
1 —#3 Wright steam trap.
1 —6" Ashcroft steam guage and siphon.

(*d*) Miscellaneous Drain Piping and Vents in Station.

32′ 0″— 8″ W. I. screw pipe.
8′ 0″— 5″ " " "

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28′ 0″— 4″ W. I. screw pipe (in 5′ trench).
55′ 0″— 3″ " " " extra heavy.
10′ 0″— 2″ " " " (in 2′ trench).
20′ 0″— 1″ " " "
20′ 0″—¾″ " " "
25′ 0″—½″ " " "
1 — 5″ elbow.
1 — 4″ "
3 — 3″ " extra heavy.
2 — 2″ "
2 — 1″ "
3 —½″ "
1 — 4″ tee.
2 — 3″ " extra heavy.
2 — 2″ "
2 — 1″ "
1 — 3″ flanged union—extra heavy.
2 — 2″ " "
1 — 1″ " "
1 — 3″ plug.
1 — 2″ "
1 — 4″ 2″ bushing.
1 — 8″ Lyman Iron exhaust head.
1 — 3″ " " " "
1 — 2″ gate valve.
1 — 1″ globe valve.
1 — 8″ McCarthy exhaust relief valve.
28′ 0″— 4″ Vitrified tile.
168′ 0″— 5″ " "
10 — 5″ " " tees.
37′ 0″— 6″ " "

Item No. 20. Piping in Station Yard (Exhibit No. 45).

Pump Suctions:

77′ 0″—10″ C. I. light weight H. & S. Weight 4,850 lbs.
Average cut 4 ft.
1 —10 x 10 x 10 tee.
1 —12 x 12 x 12 Y one branch flanged.
1 —10″ elbow H. & S.
2 —12″—10″ reducer H. & S.
Wt. of above specials 2,000 lbs.
1 —10″ gate valve H. & S.

Pump Discharges:

Extra heavy pipe carrying 305 lb. pressure.

42'—10" C. I. flange pipe weight 4,230 lbs.

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167'—10" C. I. H. & S. pipe, weight 16,920 lbs.
1—10" " flange and bell.
1—10" x 10" x 10" C. I. "Y" branch.
1—10" C. I. flange blank.
1—10" " H. & S. 45° bend.
2—10" " flanged 90° bends.
1— 8" " H. & S. 90° "
1—10"-8" C. I. H. & S. reducer.
1—10" " " tee.
1—10" x 10" x 10" C. I. H. & S. "Y" branch.
1 air chamber {1—10"-20" flanged increaser ex. heavy.
13' 0"-20" " pipe " "
1—20" " cap " "
Weight of above specials—9,220 lbs.
2—10" gate valves, Eddy.

Connection from Spring #22:

101' 0"—6" C. I. pipe H. & S. (light) weight 3,330 lbs.
1—10"-8" reducer.
1—8"-6" "
1—6"-90° bend.
1—6" x 6" x 6" tee.
Weight of above specials—684 lbs.
1—6" check valve.
2—6" gate valves.

Blow-off from Spring Line to Creek:

32' 0"—5" W. I. screw pipe 3' trench.

Blow-off from Boilers:

28' 0"—5" W. I. screw pipe extra heavy 3' trench.

Blow-off from Secondary Heater to Creek:

40' 0"—1" W. I. screw pipe galvanized.

Drain from Worthington Pit to Creek:

37' 0"—6" vitrified tile, 4' trench.

534 Item No. 21. Concrete Retaining Wall—Wall 11 ft. (Exhibits No. 37 & 45).

140 cu. yds. concrete (forms required).
350 cu. yds. earth fill behind wall.

Item No. 22. Station Yard Improvements.

(*a*) Rock Excavation for Building Site.

This rock was crushed and used in the concrete for foundations.
1,080 cu. yds. solid side hill rock.

(*b*) Fill on Lower Side of Station Site.

565 cu. yds. earth borrowed to make up deficiency not furnished by excavation.

(*c*) Wire Fence.

200 lin. ft. woven wire fence 4′ 6″ high.
24 4″ x 4″ x 8′ 0″ posts, locust, oak and poplar.

(*d*) Log Retaining Wall Along River.

170 ft. long, 3 ft. high, made of 4 or 5 logs piled up with short tie logs running into bank. 6 to 8 ft. spaced 5 to 10 ft. apart.

(*e*) Fill at Coal Chute.

210 cu. yds. fill (earth and loose rock).

Item No. 23. Station, Miscellaneous.

Radiator Frame:

3—wood standards supporting heating coil.
44—bd. ft. 3 x 6 and 2 x 4 dressed poplar.
60—C. I. pipe hangers.

Pump:

1—Weinman double acting single cylinder pump 6 x 3¾ x 8—purchased in 1907 and used only during construction of the Twin tanks.

Boiler:

1—Erie City "Economic" boiler. 80 H.P. contains 42—4″ flues, 5′ 0″ long and 76—3½″ flues, 10′ 0″ long. It is fitted with 1—4″ Angle valve.

535 1—4″ globe valve, 1 water column, 1—2″ safety valve. It was purchased in 1900 and removed in 1907 when the Stirling Boilers were placed. In fair repair.

Table:

1—office table with 4 drawers. 4′ 4″ x 3′ 0″ top. It is made of dressed oak.

Pictures and Frames:

5—frames and glasses on engine plans averaging 26″ x 38″

Coal Scales:

1—Fairbanks Morse "Standard No. 4" scale in pit.
4 cu. yds. earth excavation for pit.
Concrete in 8″ walls 4′ 0″ high and in floor of pit—4 cu. yds.

Coal Wagon:

1—No. 2 light pattern charging barrow.

Oil Filter:

1—No. 3 Cross oil filter.

Pit to Cavern under Station:

Brick lined, square manhole 12″ walls, 2″ oak cover.
4 cu. yds. rock excavation.
2,160 common red brick in Portland cement mortar.
18 bd. ft. 2″ oak plank.

Pit for Snow Auxiliaries:

51 cu. yds. earth excavation.
6½ " concrete in 10″ walls 9′ 2″ high.
256 sq. ft. 8″ concrete floor.

Iron Spiral Stairway in Auxiliary Pit:

4½ ft. in diameter 8 ft. high with hand rail.

536 Board Walk over Auxiliary Pit:

26 lin. ft. 1′ 9″ wide containing:
35 bd. ft. ¾″ tongue and groove pine.
52 " " 2 x 6—pine d 4 s.

Hangers for Pipes:

135 lbs. 1″ round rods with 3 turnbuckles incl.
25 " ½″ " " " 4 " " "

536a *The Beaver Pond Pumping Station.*

537 Item No. 24. The Beaver Pond Station Building (Exhibits Nos. 46-50, Inclusive).

The original station was built in 1892 and consisted of the present pump and one boiler enclosed in a small frame building. An addition was made in 1903 to house another boiler. This building was outgrown and the old building and boilers were removed in 1911 and the present station erected on the site of the old one. It is of wood construction, resting on stone masonry piers. The walls are of rough sheathing covered with a layor of building paper and extra heavy corrugated galvanized iron. The roof is made of Carey patented roofing, on sheathing composed of 7/8" flooring which in turn rests on the rafters. The interior is not ceiled and the building has an earth floor.

Area of floor—1,313 sq. ft.

Cubic contents, outside dimensions, from bottom of sills to average height of roof 26,566 cu. ft.

(1) Foundation:

4 cu. yds. Portland cement rubble masonry piers.

(2) Walls and Framing:

1,734 bd. ft. oak in sills, joists, posts, etc.
2,553 " 1" oak sheathing on walls.
285 sq. yds. building paper.
285 " #23 gauge corrugated galv. iron.

(3) Lumber in Roof:

2,015 sq. ft. 7/8" dressed pine tongue and grooved flooring for sheathing.
1,856 bd. ft. rough oak lumber in rafters and bracing.
237 " trim at eaves—dressed yellow pine painted two coats.

538 (4) Roofing:

225 sq. yds. Carey patented roofing (tarred paper and cloth).

(5) Doors and Windows:

All doors, sashes and frames are of yellow pine, painted two coats.

4 double sash windows—one sash fixed, one sliding. Each sash 34" x 36", with 6 lights 10" x 16".

3 double sash windows—one sash fixed, one sliding, each sash 28" x 32", with 4 lights 10" x 14".

2 doors 3' 0" x 7' 0" made of 2 layers of tongue and grooved 7/8" yellow pine flooring.

(6) Coal Bin:

1,251 bd. ft. rough oak in joists, siding and flooring.

(7) Painting:

All doors, windows and trim at eaves painted two coats.

Item No. 25. Steel Stack and Breeching (Exhibit No. 51).

(*a*) Stack.

1,800 lb. No. 10 steel in stack and breeching.

(*b*) Anchors.

6 cu. yds. excavation for tie rods.
2 cu. yds. concrete for tie anchors.
4—1″ anchor rods with eye, 6′ 0″ long and plate 1′ 0″ x 1′ 0″ x ½″.
330 lin. ft. ⅜″ woven wire rope for bracing.
380 " " ⅜″ twisted wire rope for bracing (6 strand).

The stack and breeching are painted.

539 Item No. 26. Worthington Pump (Exhibit No. 52).

1 Duplex double acting horizontal steam pump Size, 20″ x 10¼″ x 20″—Plungers cut down to 9″. Operates under 100# steam pressure against 359′ head. Capacity 1 Million Gallons per day.
Erected in 1892.

(*a*) Foundation.

5 cu. yds. excavation.
4 cu. yds. stone masonry laid in Portland cement.
1—6′ 0″ x 3′ 4″ x ½″ iron plate bolted on top of foundation with 4—1″ anchor bolts 12″ long.

Item No. 27. Feed Water Heater.

Feed water heater 4′ 6″ high x 20″ diameter.
140# C. I. in legs.

(*a*) Foundation.

1 cu. yd. excavation.
1 " " Portland cement concrete.

Item No. 28. Boiler Plant (Exhibits Nos. 53 & 54).

(*a*) 80 H. P. Boiler.

Boiler made by the Erie City Iron Works. 80 H. P. horizontal, tubular boiler, 54" diameter and 15' 0" long, and containing 64—3" tubes. The boiler is designed for a working pressure of 100 lbs.

Purchased about 1890 by Graham Lumber Co., taken over by Water Works in 1898 and installed in present location. All new tubes put in in 1912.

Fixtures:

Boiler is furnished with C. I. front, flues, grates, doors etc., complete.

Fittings:

1 2" Lonegar pop safety valve.
1 6" Ashcroft steam gauge with siphon and cock.
1 Combination #1 Wright Improved water column with glass gauge and 3 cocks.

540 (*b*) 100 H. P. Boiler.

Boiler made by the Erie City Iron Works, 100 H. P. horizontal tubular boiler 60" diameter and 16' 0" long and containing 54—4" tubes. The boiler is designed for a working pressure of 100 lbs

Purchased about 1901 and installed in Ada pumping Station. Moved to Beaver Pond in 1911 and erected in present setting.

Fixtures:

Boiler is furnished with C. I. front, flues, grates, doors, etc., complete.

Fittings:

1 2½" Scott pop safety valve.
1 6" Ashcroft steam gauge with siphon and cock.
1 Combination #1 Wright Improved water column with glass gauge and 3 cocks.

(*c*) Miscellaneous Piping on Both Boilers.

Water Columns, Whistle, etc.:

8′ 0″—1¼″ W. I. screw pipe.
5′ 0″—1″ " " " "
2 1¼″ elbows.
2 1″ street elbows.
2 1¼″ tees.
2 1″ "
1 1¼″ union.
2 1″ "
1 1¼″—1″ bushing.
2 1″ plugs.
1 1¼″ globe valve.
1 1″ " "

Boiler Blow-off Pipes:

1′ 0″—2½′ W. I. screw pipe
6′ 0″—2″ " " "
1′ 0″—1¼″ " " "
2′ 0″—1″ " " "
6′ 0″—¾″ " " "
1 1¼″—1″ reducing coupling.
1 1″ tee.
1 1″ street elbow.
1 1″ union.
1 1″—¾″ bushing.
1 ¾″ elbow.
1 1″ Globe valve.
1 ¾″ " "

541 (*d*) Boiler Settings.

The boilers are set on a concrete foundation four feet deep. The setting consists of No. 1 hard burned brick set in lime mortar and lined with fire brick. The whole is tied together with longitudinal tie rods and stiffeners on the side walls.

Quantities:

40 cu. yds. excavation in trenches.
36½ " Portland cement concrete.
19,000 No. 1 hard burned brick in lime mortar.
400 fire brick.
48 sq. ft. 8″ concrete floor in ash pit.
380 lbs. C. I. in stiffeners.
550 lbs. shaped steel in bracing.
140 " ⅞″ round wrought iron rods in bracing.

Item No. 29. All Piping in Station.

(*a*) Water Pipes.

All pipes to carry water from main to heater and from heater to boilers. The main was tapped and the 1½" pipe screwed into it.

46' 6"—1½" W. I. screw pipe.
46' 0"—1¼" " " "
1—1½" Tee.
4—1¼" "
1—1½" elbow.
7—1¼" "
4—1¼" union.
2—1½" plug.
1—1⅛"—1¼" bushing.
1—1½" plug valve.
4—1¼" Globe " (Jenkins).
2—1¼" check "

(*b*) Steam Pipes.

Steam pipe from flange on pump to dome on boilers.

30' 4"—4" extra heavy W. I. screw pipe.
4—4" elbows.
1—4" tee.
5—4" flange unions.
1—5"—4" reducing bushing.
1—5" angle valve.
4—4" globe valve, extra heavy (Crane No. 23).

542 Exhaust pipe from pump to heater and from heater to outside of building.

30' 6"—5" W. I. screw pipe, extra heavy.
4—5" elbows.
1—5" flanged union.
1—5"—4" reducing coupling.
1—5"—4" " elbow.

(*c*) Miscellaneous Small Pipe in Station.

Drains on pump and other station piping.

43′ 6″—1½″ W. I. screw pipe.
6′ 0″— ½″ " " "
6—1½″ unions.
4— ½″ "
1—1½″ tee.
3— ½″ "
1—1½″ elbow.
4— ½″ "
1—1½″—1″ reducer.
2—1″ nipples.
1—1½″ globe valve (Lunkenheimer).
1—1½″ " " (Jenkins).
1—1½″ angle valve "
4— ½″ globe valves "

By-pass on pump discharge line around gate valve.

2—1″ corporation cocks.
1—1¼″ plug valve.
2—1¼″ elbows.
1—1¼″ union.

(*d*) Suction Line for Pump.

From flange and spigot pipe on pump to edge of station building.

5′ 0″—10″ C. I. water pipe H. & S., wt. 390 lbs.
4′ 0″— 8″ " " " " 230 "
1—10″ 22½° bend, H. & S.
1—10″ x 8″ reducer, "
1— 8″ tee, "
1— 8″ plug.
Approx. wt. of above specials 750 lbs.

543 (*e*) Discharge Line for Pump.

From flange on pump to and including increaser at edge of building.

32′ 0″—8″ C. I. water pipe, H. & S., *et.* 1,790 lbs.
1—8″ C. I. 45° bend—flanged and spigot.
1—8″ " " " —H. & S.
1—8″ " 90° " "
1—8″ " tee "
1—8″—10″ increaser "
1—8″ plug.

Wt. of above Specials 1,030 lbs.

1—8″ check valve, flanged.
1—8″ gate valve, H. & S. (Eddy).

Item No. 30. Intake and Pipe Line to Pumping Station (Exhibit No. 55).

The intake consists of a wooden box embedded in the stream emerging from the Beaver Pond Spring. This box has a screen cover and contains a foot valve.

Quantities:

60 bd. ft. 2" oak lumber (rough).
1 perforated iron plate 30" x 30" x ⅛", wt. 32 lbs.
135' 0"—10" C. I. water pipe, H. & S. (light) cut 3' 0". Weight 8,600 lbs.
1—10" 22½° bend H. & S. Weight 202 lbs.
1—10" foot valve.

Item No. 31. Station Miscellaneous.

1—1 pint lubricator.
1—revolution counter on pump.

543a *The Distribution System.*

544 Item No. 32. Cast Iron Street Mains (Exhibits Nos. 57 & 58).

1,664.3 tons C. I. pipe in Street Mains.
The above pipe is all Class "B" with the following exceptions:

4,500' of 10" @ 56 lbs. per ft.
2,930' " 10" @ 60 " " "
4,130' " 10" @ 70.8 " " "

Only the records of the Beaver Pond Line are available for the weights of the early pipe lines. Since 1908, the pipe purchased has conformed to Class "B" American Water Works Association Standard.

Item No. 33. Cast Iron Specials in Street Mains (Exhibit No. 59).

32.11 tons of C. I. specials in Street Mains.

Basis for Weight of Specials:

The distribution system was gone over intersection by intersection and the specials actually required to interconnect the mains were listed (See Exhibit No. 59). These total to 1.93% of the weight of the pipe. This amount was arbitrarily increased to 2%. No tees for hydrant connections are included in the above which accounts for the percentage of specials being taken as 2%, instead of the customary 2.5%.

Item No. 34. Laying Cast Iron Street Mains (Exhibits Nos. 57 and 58).

Ordinary trenching including excavation, laying yarn, lead and backfill. All pipes have 2 ft. of cover.

The greater portion of the ordinary trenching in Bluefield is more difficult than the average as large boulders, rock, gravel and shale are encountered, which means almost continuous picking.

The average depth of trench is 2½ feet.

15,350	lin.	ft.	10″	pipe.
11,840	"	"	8″	"
31,475	"	"	6″	"
28,336	"	"	4″	"
10,495	"	"	3″	"
97,496	"	"	of C. I. Pipe in Mains.	

Item No 35. Galvanized Iron Street Mains (Exhibits Nos. 57 & 58).

As there is no other source for water in Bluefield, it has been the practice of the Water Company to lay galvanized iron mains through even very sparsely settled districts in order to accom-odate the few houses already built. As these districts are built up these smaller mains are either taken up or abandoned and cast iron put in. The many scattered and sparsely settled subdivisions in the city make the mileage of galvanized mains unusually large.

220	lin.	ft.	2½″	galv.	iron	mains.
2,950	"	"	2″	"	"	"
31,055	"	"	1½″	"	"	"
19,615	"	"	1¼″	"	"	"
4,470	"	"	1″	"	"	"
7,115	"	"	¾″	"	"	"
4,060	"	"	½″	"	"	"
69,485	"	"	galvanized iron mains.			

Item No. 36. Laying Galvanized Iron Street Mains (Exhibits Nos. 57 & 58).

Ordinary trenching including excavation, laying and backfill. As in the case of the cast iron mains, this trenching is more difficult than the average due to rocks, boulders, shale and gravel, which necessitates picking throughout most of the trench.

The average depth of the trench is 2 feet

69,485 lin. ft. of ½″ to 2½″ galv. iron pipe in mains.

Item No. 37. Extra for Unusual Excavation (Exhibits Nos. 60 & 61).

The quantities listed under this item were determined by a careful inspection covering the entire distribution system in which the location and extent of the difficult excavation necessary was noted by the character of the surface soil. This information was supplemented by a detailed statement of materials encountered which was furnished to us by the foreman on pipe laying.

There are two classifications of the difficult excavation, rock and shale. The rock is a solid limestone unusually hard to drill and shoot and being folded so that the strata lie almost vertically; the cost of this work is very high. The actual cost of drilling and shooting one stretch of trench was over a dollar a lineal foot. The shale is very seamy and, like the rock, lies in almost a vertical plane. This makes it extremely slow work to excavate as it cannot be shot and picking does not loosen it in large pieces.

Rock and Shale Trenches:

1,285 cu. yds. solid rock excavation.
6,680 " " shale excavation.

Wet Trenches:

In addition to the above, water was encountered along Adams Street for 1,830 feet in such quantities as to require constant pumping.

1,830 lin. ft. of wet trench.

547 Under Buildings:

Between Hardy St. & Roanoke St., the 4" line lies under two warehouses for a distance of 260 ft. Were this line to be relaid parallel to the switch track of the railroad where it would be accessible, it would require a small amount of extra pipe which amount is:

10 ft. 4" pipe laid in 2 ft. earth trench.

Item No. 38. Steam Railroad Crossings (Exhibits Nos. 61 & 63).

There are five steam railroad crossings, four of which lie under the main line and yards of the Norfolk & Western Railroad where the tracks are continually in use. These yards are unusually busy, as Bluefield is the end of the electrification system as well as a division point and the yards contain extensive shops, round house and repair tracks.

Over and above the cost for ordinary trenching for pipe laid across the following railroad crossings:

Hardy St. near Roanoke St.:

The 4″ main is depressed as it passes diagonally under a switch track at this point, the requirements of the railroad calling for 5 feet of cover over pipes passing under tracks.

20 feet of 4″ pipe in 5½ ft. trench under 1 track.

Pearis St. Crossing:

At Pearis St. the 8″ main crosses the main line of the Norfolk & Western R. R. under 9 tracks. On the South side the tracks are approximately 4 ft. above Pearis St. and the fill is supported by a timber retaining wall. The pipe enters the railroad property
548 under this wall at a depth of 8½ feet below the first track. It rises as it crossed the tracks until there is only 6 feet of cover on the north side, here it follows the slope up to the grade of the Pulaski St. main. The excavation was not exceedingly difficult, the chief obstruction being the tracks and the continuous switching of trains.

Length of crossing 212 feet.

Thomas St. Crossing:

At Thomas St. a 4″ main crosses the main line of the railroad under 8 tracks. This crossing was very expensive as the north half of the pipe lies through solid rock and the labor of getting a trench opened up without interfering with traffic was difficult and costly.

The depth of trench was 5 feet.

Length of crossing 220 feet.

Mercer St. Crossing:

This is at the most congested part of the yards as it is near the depot and the waiting tracks for engines are at this point. The railroad is depressed about 15 ft. below the levels of Princeton Ave. and Roanoke St. and massive masonry retaining walls 12 ft. thick at the base support the side of the cut. On the Princeton Ave. side there are two of these walls with an incline road leading down into the yards between. This incline is paved with cob-le stones. The pipe at Princeton Ave. drops vertically from a tree and elbow 12
549 feet and then swings under the two retaining walls, turns west for 60 ft. then north crossing under 15 tracks at a depth of 5 feet until it reaches Roanoke St. where it turns up in an elbow and rises vertically 23 feet to an elbow and tee in the street main.

Length of crossing 330 feet.

Logan St. Crossing:

Near Logan St., there is a 6″ pipe crossing under 17 tracks. At this point in the years, the coal trains are made up while the three north tracks are used for car repair purposes. The pipe crosses

under the tracks at a depth of 5 feet and the same amount of delay caused by heavy railroad traffic was encountered at this point as at the other crossings.

Length of crossing 520 feet.

Item No. 39. Street Railroad Crossings (Exhibit No. 64).

Extra over and above the cost of ordinary trenching for pipe crossings under street railway tracks.

Cast Iron Mains:

Right angle crossings—24 tracks crossed.
Diagonal crossings — 4 " "

Galvanized Iron Mains:

Right angle crossings—4 tracks crossed.
Diagonal crossings —2 " "

550 Item No. 40. Pavements over Street Mains (Exhibits Nos. 65 & 66).

Extra over and above the cost of ordinary trenching for pipes laid under paved streets.

(*a*) Brick on Concrete (Exhibit No. 66*a*).

Brick on 6" concrete base.
19,965 lin. ft. of Cast Iron Mains.
835 " " " Galv. " "

(*b*) Granite Block on Concrete (Exhibit No. 66*b*).

Granite block on 6" concrete base.
520 lin. ft. Cast Iron Mains.

(*c*) Plain Macadam (Exhibit No. 66*c*).

2½ top on 5" stone base.
6,940 lin. ft. Cast Iron Mains.
925 " " Galv. " "

(*d*) Bitulithic Macadam on Concrete (Exhibit No. 66*d*).

2" macadam on 4" concrete base.
14,215 lin. ft. Cast Iron Mains.
710 " " Galv. " "

(*e*) Water Bound Macadam (Exhibit No. 66*e*).

8" thick.
3,730 lin. ft. Cast Iron Mains.
25 " " Galv. " "

(*f*) Mains in Parking.

When mains are placed in the parkings on streets already paved, it is necessary to protect as much as possible the sod and when the work is complete all sod that has been removed is replaced and the parking restored to its former appearance.

1,780 lin. ft. Cast Iron Mains.
5,780 " " Galv. " "

551 Item No. 41. Valves on Mains (Exhibits Nos. 57 & 67).

6—10" Double gate valves.
23— 8" " " "
82— 6" " " "
63— 4" " " "
20— 3" " " "
1— 8" Check Valve.
1— 6" " "
1—10" Electro hydraulic gate valve.
1— 8" " " " "
1— 6" " " " "
199 valves in place.

Fittings on the Electro Hydraulic Valves:

Bland St. Valve (10"):

7'—¾" galv. iron pipe.
6—¾" elbows.
2—¾" unions.
1—¾" strainer.
1—¾" cut off.

Pearis St. Valve (8"):

5'—¾" galv. iron pipe.
9—¾" elbows.
2—¾" unions.
1—¾" strainer.
1—¾" cut off.

Princeton Ave. Valve (6"):

6'—¾" galv. iron pipe.

Item No. 42. Valve Boxes on Mains.

(*a*) Vaults for Electro-Hydraulic Valves.

(1) Cor. Peris & Fourth Streets:

A rectangular vault made with 8" brick walls and a reinforced concrete and brick slab roof containing a C. I. manhole cover. The

inside walls of the vault are plastered with cement mortar and there is a 4" drain tile reaching to the sewer.

552 5 cu. yds. excavation (earth).
900 brick laid in cement mortar.
28 ft. 4" x 4" x 9.8# angles in roof, weight 274 lbs
460 lbs. C. I. in cover and frame.
15 ft. 4" vit. tile in 5' trench.

(2) Cor. Bland and Higginbotham Streets:

A rectangular vault blasted out of solid rock. The walls are 8" brick with the inside plastered with cement mortar. A C. I. manhole cover is grouted on the sidewalls—Vaults in brick pavement.

Quantities:

3 cu. yds. excavation (solid rock).
800 common red brick in cement mortar.
460 lbs. C. I. in cover and frame.

(3) On Princeton Ave. near Giles Street:

A rectangular vault with 8" brick walls and a cast iron cover. Inside of walls plastered with cement mortar.

Quantities:

2½ cu. yds. excavation (earth).
820 common red brick in cement mortar.
460 lbs. C. I. cover and frame.
20'—4" vit. tile drain in 3 ft. trench.

(*b*) Cast Iron Valve Boxes.

188 C. I. valve boxes weighing 58 lbs. each.

Item No. 43. Fire Hydrants (Exhibit No. 68).

The first 15 hydrants installed are owned by the Water Company, but all other hydrants are owned by the City. The Water Company buys the hydrants and sets them under the direction of the city, billing them for all materials and labor used, which includes

553 the cost of the hydrants, specials, valve, valve box and pipe in the branch.

15—4" Eddy hydrants 2—2½" nozzles with barrel 3½ ft. long. There are in addition 103 hydrants owned by the city.

Item No. 44. Services and Fittings.

The taps and corporation cocks are placed by the Company without charge. Each service consists of corporation cock, goose neck, pipe to curb, curb cock and box. Previous to April 1, 1908, the service pipes were of galvanized iron pipe but since that date they

have been made of lead with an average length of 16 feet. On April 1, 1908, there were 1,597 services in use. Where meters are installed the Company puts in the meter, meter box and couplings.

Services in Use:

Size.	No. in use.
6"	1
4"	3
3"	2
2"	8
1½"	3
1"	14
¾"	2
½"	2,201
Total Services	2,234

(Jan. 1, 1915.)

554 Item No. 45. Meters in Service.

1—4" Gem.
1—2" Neptune (Compound).
3—1" "
6—2" Nash.
1—1" Neptune.
1—1½" Lambert.
1—¾" Neptune.
1—1" Keystone.
179—½" Empire.
347—½" Neptune.
8—½" Crown.
1—1" Lambert.
389—½" Niagara.
365—½" Keystone.
12—½" Hersey.
1—1" Nash.
100—½" "
1—½" Standard.
149—½" Gamon.

1,467—Total number of meters in service January 1, 1915.

Item No. 46. Meter Boxes and Vaults.

1,458 Standard Meter Boxes:

A meter box consisting of 1 joint of 18" vit. tile with no bell and a C. I. cover and ring. Weight of the iron cover and ring 65 lbs.

1 Meter Vault on Gravity Spring Line:

Made of 10" concrete walls with an 8" reinforced concrete roof containing 3 extra heavy meter box covers. The vault is 10' 0" x 4' 6" x 3' 0" high (inside dimension) and contains 6—2" meters and fish traps connected between two parallel 6" stub pipes leading off from the Gravity Spring line. A gate valve located in the spring line between these stubs makes it possible to either by-pass the meters or force the water to flow through them. The vault is connected with a drainage ditch by 21 ft. of 6" vit. tile.

Quantities:

11 cu. yds. excavation (earth).
5 " concrete in walls and roof.

555

635 lbs. ¾" round rods.
3 C. I. meter box covers, ex. heavy, approx. weight 100 lbs. each.
21 ft. 6" vit. tile in 3' trench.
10' 0"—6" C. I. pipe, H. & S. Wt. 330 lbs.
20' 0"—6" W. I. screw pipe.
2—6" C. I. Y-branches weight 362 lbs.
2—6" " 45° bends " 210 "
12—6" x 2" C. I. tees for screw pipe.
6—2" companion flanges.
24—2" elbows.
36—2" nipples.
2—6" plugs.
3—6" C. I. gate valves H. & S.
6—2" fish traps.
6—2" meters (Listed in Item No. 45).

1 Brick Meter Vault (N. & W. R. R. on Hardy St.):

5' 0" x 3' 6" x 3' 0" high (outside dimensions) with 8" brick sidewalls and 2" plank cover.

Quantities:

2 cu. yds. excavation (earth).
640 common red brick in cement mortar.
35 bd. ft. 2" oak plank.

1 Brick Meter Vault (Matz Hotel):

4' 0" x 3' 8" x 3' 6" high (inside dimensions) with 8" brick walls and large C. I. manhole cover and frame. Under cement sidewalk.

Quantities:

4 cu. yds. excavation (earth).
900 common red brick in cement mortar.
1 C. I. cover and frame—wt. 640 lbs.

1 Brick Meter Vault (Pocahontas Coal Company):

3′ 0″ in inside diameter by 2′ 8″ high with 8″ brick walls and a C. I. manhole cover and frame. Vault built under cement sidewalk.

Quantities:

2 cu. yds. excavation (earth).
450 common red brick in cement mortar.
1 C. I. cover and frame—wt. 600 lbs.

556 Extra for Placing Standard Meter Boxes in Concrete.

Sidewalks:

These boxes are on business streets and some residence streets where it is impossible to put them anywhere excepting under the walk.
434 meter boxes placed in cement sidewalks.

557 Item No. 47. Twin Tanks (Exhibits Nos. 69 & 70).

The Twin Tanks are placed on top of the hill separating Bluefield from South Bluefield. The hill top was levelled down enough to make room for four tanks but only two have as yet been installed. This grading was very difficult and expensive as it was all shale in vertical layers. Holes were drilled and the ground blasted, then heavy plows broke it up further. The tanks are identical in construction and consist of a steel shell placed on a 2 ft. concrete foundation. The roofs are of 1″ sheathing covered with heavy tar paper and are supported by steel trusses. There is a ventilator on each tank and a trap door through the roof. A ladder reaching the full height of the tank is bolted to the outside. Each tank is fitted with a 10″ supply pipe, a 12″ overflow and a 12″ washout.
The site of the tanks is very difficult of access owing to the excessive grades and the cost of construction was thus increased considerably.
The tanks are each 50 feet high by 50 feet in diameter and were built in 1906.

Quantities:

Excavation for Site of Tanks:

1,198 cu. yds. hard shale excavation.
1,765 " " " " " (for future tanks).

Foundations for 2 Tanks:

315 cu. yds. concrete.

558 Material in 2 Tanks:

486,000 lbs. steel in tanks.
38,400 " " " roof trusses.
5,500 bd. ft. of lumber in sheathing and prulins.
166 squares tar paper.

Piping and Drains.

Overflow Drain for 2 Tanks:

88' 0"—12" Vit. tile.
8 —12" " " tees.

Overflow for 2 Tanks:

122' 0"—12" C. I. pipe, flanged, wt. 9,340 lbs.
2 —12" C. I. elbows, flanged, " 580 "

Washout for 2 Tanks:

28' 0"—12" C. I. pipe, flanged, wt. 2,140 lbs.
2 —12" C. I. elbows, flanged, wt. 580 "
2 —12" " gate valves, " "

Supply for 2 Tanks:

30' 0"—10" C. I. pipe, flanged, wt. 1,770 lbs.
2 —10" C. I. elbows, "
2 —10" " "Y" branches, H. & S.
1 —10" " Plug.
Approx. wt. of above specials 1,320 lbs.
2 —10" C. I. gate valves, H. & S.

Painting:

The tanks are painted two coats.
31,400 sq. ft. of two coat painting.

Item No. 48. Bland Street Tank (Exhibits Nos. 71 & 72).

The tank is made of steel plates varying from 3/16" to 3/8" in thickness. It is 35 feet high by 35 feet in diameter and sets on a stone masonry foundation in a hollow cut out of the side of
559 the hill. A picket fence made of 2½" x ¼" iron bars surrounds the top of the tank and an iron ladder reaches to the top, both inside and outside. A manhole is located near the bottom. The tank contains 2 inlets, one from the Gravity Springs and one from the Twin Tanks operated by float valve.

The excavation is in hard shale. Two small concrete retaining walls are built on the hillside below the tank as a protection against the washing out of the earth below the foundation.

Quantities:

1,110 cu. yds. shale excavation.
180 " " stone masonry in foundation.
70,000 lbs. of steel in tank.
6 cu. yds. concrete in retaining walls.

Piping and Drains:

Overflow and Drain:

36′ 0″—10″ C. I. pipe, flanged, 2,120 lbs. weight.
1 —10″ C. I. elbow, " 210 " "
15′ 0″—12″ Vit. tile in 2′ trench.
220′ 0″—10″ " " " " "

Piping:

278′ 0″—10″ C. I. pipe, H. & S. Wt. 17,750 lbs.
10′ 0″—12″ " " flanged " 764 "
330′ 0″— 6″ " " H. & S. " 11,000 "
1 —10″—12″ C. I. increaser.
2 —10″ x 6″ C. I. tees.
1 —10″ x 8″ C. I. "Y" branch.
1 —12″ C. I. elbow.
5 — 6″ C. I. elbows.
1 — 6″ C. I. 45° bend.
Approx. wt. of above specials 2,522 lbs.
3 —10″ gate valves.
2 — 6″ " "

560 Item No. 49. Electric Transmission Line.

The three electro-hydraulic valves are operated from three switches in the Water Works office. The current is taken from a battery consisting of 20 dry cells. The transmission line is made of 2 lines of No. 12 copper clad wire strung on 30 ft. poles with glass insulators on 2-pin cross arms, braced with galvanized braces.

Quantities:

55—30′ poles.
58—2 pin cross arms.
130—pins.
130—glass insulators.
42—24″ galv. iron cross arm braces.
510—lbs. No. 12 B. & S. gauge copper clad wire.
20—dry batteries.

560*a* *Miscellaneous.*

561 Item No. 50. Inventory of Laboratory Equipment (Exhibit No. 73).

Includes all apparatus and chemicals in the laboratory.

Item No. 51. Inventory of Office Furnishings (Exhibit No. 74).

Includes all furnishings in the office building.

Item No. 52. Inventory of Materials & Supplies (Exhibit No. 75).

Includes all tools, supplies, vehicles, pipe, etc., at the Ada Pumping Station, in the pipe yard and in the Meter Shop.

Item No. 53. Cost of Engineering and Superintendence.

These costs to begin with the surveys and preparations of such detailed plans as are finally agreed upon in the franchise requirements, and end with the completing and placing of the plant in operation.

It covers the following items:

(*a*) Salary and Expenses of Superintendent and Engineering Force.
(*b*) Preparation of Detailed Plans.
(*c*) Preparation of Specifications.
(*d*) Preparation and Letting of Contracts.
(*e*) Setting of Lines and Grades.
(*f*) Inspection of Work.
(*g*) Estimates of Contractor.
(*h*) Purchase of Material and Supervision of Labor where it is not contracted.
(*i*) Final Tests and Adjustment of Contracts.
(*j*) The placing of the Plant in Successful Operation.

And, in general, all the ordinary engineering, superintendence and technical management of the construction.

562 Item No. 54. General Administrative and Legal Costs.

Including the salaries and expenses of the Company's Officers, Accountants and Attorneys during the period of construction, commencing at the end of the time covered by Preliminary Costs, and continuing to the time when the plant is put in successful operation.

These costs include:

(*a*) Salaries of General Officers.
(*b*) Salaries and Expenses of Office Assistants.
(*c*) Cost of Accounting.
(*d*) Legal Advice.
(*e*) Rent and Office Expense.

Item No. 55. General Contingent Costs During Construction.

Being all costs growing out of omissions or unforeseen changes or events during construction.

This item includes:

(*a*) Changes in Construction due to Unforseen Obstacles developed during the Progress of the Work.
(*b*) Rise in prices of material or labor above Normal.
(*c*) Financial Panics.
(*d*) Inclement Weather causing Delays.
(*e*) Floods causing Both an Actual Property Loss and Unavoidable Delays.
(*f*) Failure of Contractors.
(*g*) Especial Unforseen Difficulties encountered in Deep Excavations.
(*h*) Strikes.
(*i*) Litigations.
(*j*) Taxes and Assessments on Real Estate and Personal Property for one Year.
(*k*) Insurance.

And, in general, all costs which experience has shown must be allowed for by a prudent man engaging in a large constructive enterprise over and above that which can be specifically enumerated.

563 Item No. 56. Interest During Construction Period.

Being computed upon the theory that all of the moneys required for materials and labor, Engineering and Superintending costs; General, Legal and Contingent costs, Real Estate and Preliminary costs were expended in growing amount prior to and during the period of construction.

Item No. 57. The Going Concern Value.

When the Cost of Reproduction is used to determine the value of the Plant, the Going Concern Value is the Cost of Reproducing the business and income of the Company.

Item No. 58. Operating Capital.

This includes such cash on hand as may be necessary to conduct the business of this Company and which cannot be withdrawn or used for other purposes.

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567 [Illustration omitted.]

View of the City from the Bland Street Tank.

[Illustration omitted.]

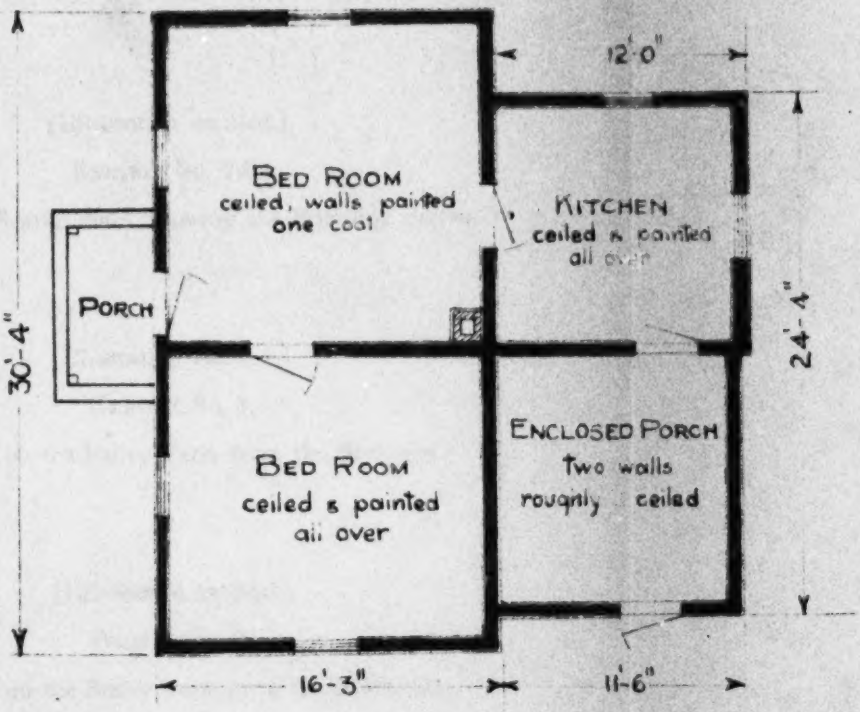
View of South Bluefield from Washington Street Hill.

(Here follows Exhibit No. 1, marked page 568.)

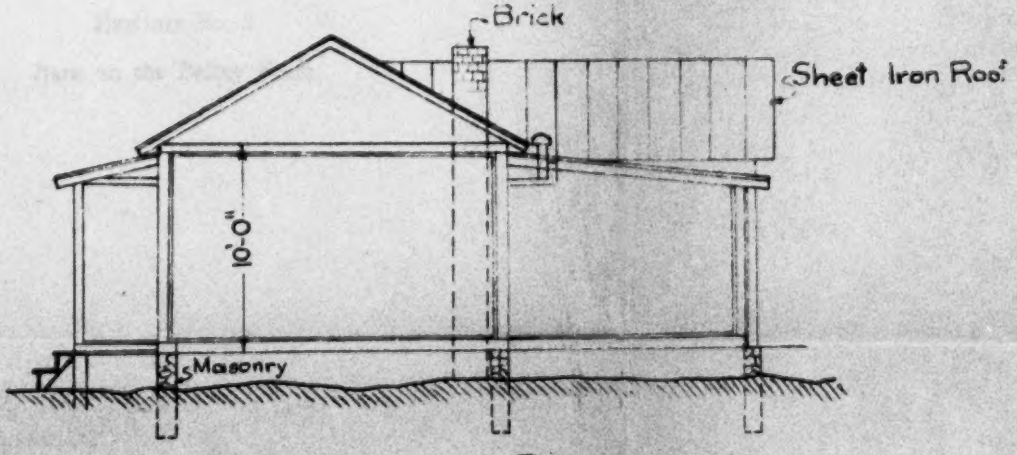
Exhibit No. 1

COTTAGE AT BEAVER POND

Scale ⅛" 1'-0"



PLAN



SECTIONAL ELEVATION

569 [Illustration omitted.]

EXHIBIT No. 2-A.

Dwelling at Beaver Pond.

[Illustration omitted.]

EXHIBIT No. 2-B.

Dwelling at Beaver Pond Showing the Pumping Station.

570 [Illustration omitted.]

EXHIBIT No. 3.

Dwelling on the Bailey Farm from the Northeast.

[Illustration omitted.]

EXHIBIT No. 4.

Dwelling on the Bailey Farm from the Northwest.

571 [Illustration omitted.]

EXHIBIT No. 5.

Barn on the Bailey Farm.

[Illustration omitted.]

EXHIBIT No. 6.

Dwelling at the Ada Spring.

572 [Illustration omitted.]

EXHIBIT No. 7.

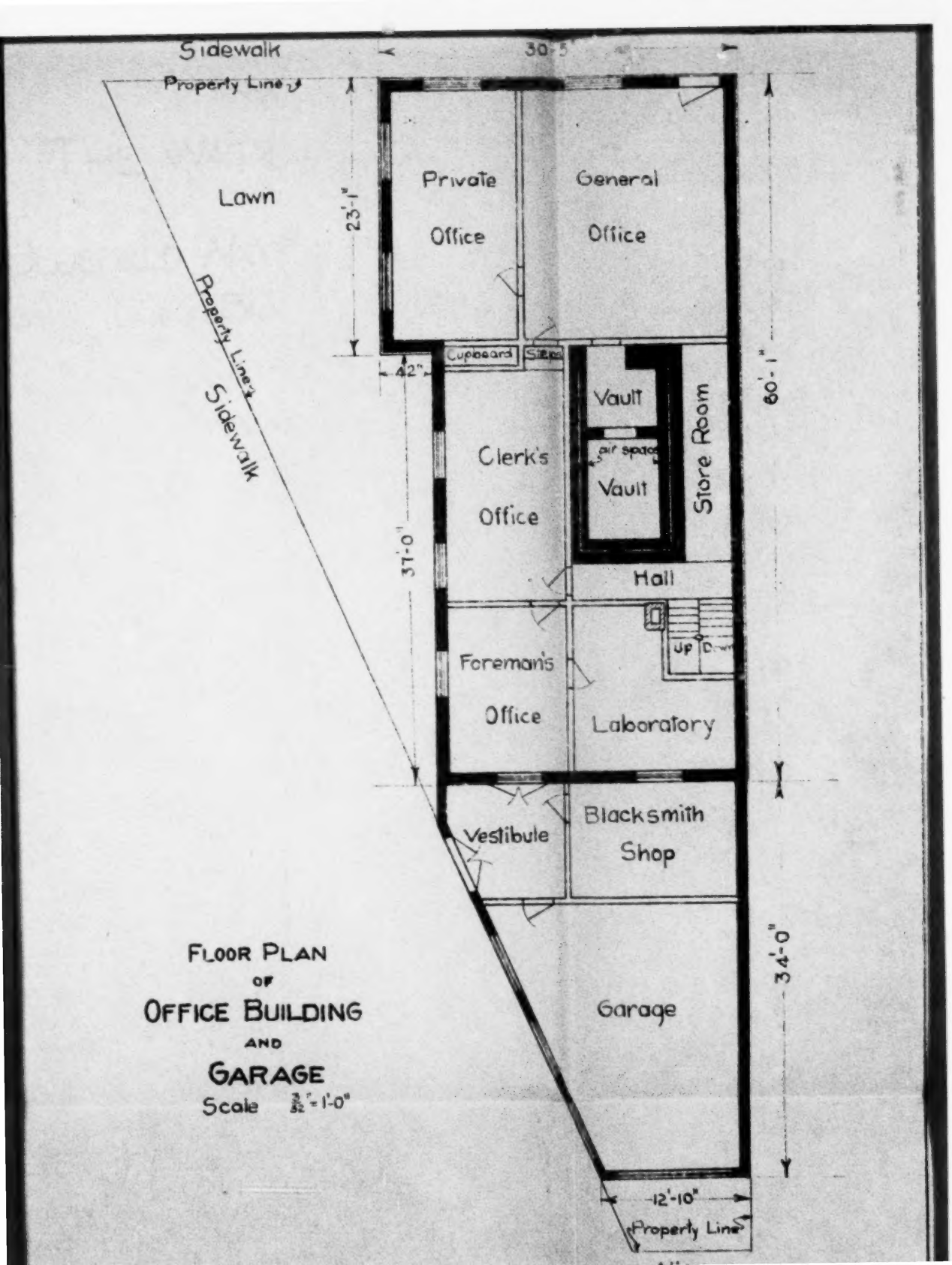
Dwelling on the Ruble Farm from the West.

[Illustration omitted.]

EXHIBIT No. 8.

Dwelling on the Ruble Farm from the East.

(Here follows Exhibit No. 9, marked page 573.)



FLOOR PLAN
OF
OFFICE BUILDING
AND
GARAGE
Scale 3/32"=1'-0"

CITY OF BLUEFIELD

HILL AVE.
PULASKI ST.
HARDY ST.
WAYNE ST.
PRINCETON AVENUE
BLUEFIELD AVE.
ROGERS ST.
THIRD ST.
FOURTH ST.
HIGHLAND AVE.
CAROLINA
MERCER ST.
BLAND ST.
TANK
RALEIGH ST.
WYOMING ST.
LEE ST.
HIGH ST.
CALHOUN
PENDLETON AVE.
WHEELING TER.
TWIN TANKS
ELLIS ST.
PRESTON AVE.
BOWYER ST.
ADAMS STREET
WYTHE AVE.
JEFFERSON STREET
BLAND
CUMBERLAND
CITY OF BLUEFIELD
BEAVER POND PUMPING STA.
BEAVER POND SPRING #23
#1
#2
#3
#4
#5
#6
#7 & #8
#9
10"
8"
6"
4"

MAP SHO

THE WATER SUP

OF T

BLUEFIELD WATER WOR

BLUEFIELD

ALVORD &
Engineers

NORFOLK & WESTERN RAILROAD

SEWAGE DISPOSAL PLANT

ADA PUMPING STATION

ADA DEPOT

RIVER

ADA SPRING

TURNPIKE

GAP

EAST

10"
8"
6"
4"
3"
10" 8" 6" 4" 3"

*9 *10 *11 *12 *13 *14 *15 *16 *17 *20 *21 *22

0 600 1200 1800 2400 3000 3600
SCALE OF FEET

LEGEN

10"
8"
6"
4"
3"
Spring

EXHIBIT No. 13

MAP SHOWING
THE WATER SUPPLY SYSTEM
OF THE
BLUEFIELD WATER WORKS & IMPROVEMENT CO
BLUEFIELD, W. VA.

ALVORD & BURDICK
Engineers Chicago

LEGEND

- 10" Pipe
- 8" "
- 6" "
- 4" "
- 3" "
- Spring Houses

NORFOLK & WESTERN RAILROAD

ADA DEPOT

RIVER

ADA PUMPING STATION

ADA SPRING

JERRELL SPRING * 9

TURNPIKE

*12 *13 *14 *15 *16 *17 *18 *20 *21 *22

10" 8" 6" 4" 3"

EAST

N

600 1200 1800 2400 3000 3600
SCALE OF FEET

574

[Illustration omitted.]

EXHIBIT No. 10.

Office Building and Garage.

[Illustration omitted.]

EXHIBIT No. 11.

Office Building and Garage, Rear View.

(Here follows Exhibit No. 12, marked page 575.)

576 [Illustration omitted.]

EXHIBIT No. 13.

Method of Laying Infiltration Lines, the Open Trench.

[Illustration omitted.]

EXHIBIT No. 14.

Method of Laying Infiltration Lines, the Vitrified Tile in Place.

577 [Illustration omitted.]

EXHIBIT No. 15-A.

Method of Laying Infiltration Lines, Crushed Rock Around Tile.

[Illustration omitted.]

EXHIBIT No. 15-B.

Method of Laying Infiltration Lines, Ready for Earth Covering.

578 [Illustration omitted.]

EXHIBIT No. 16.

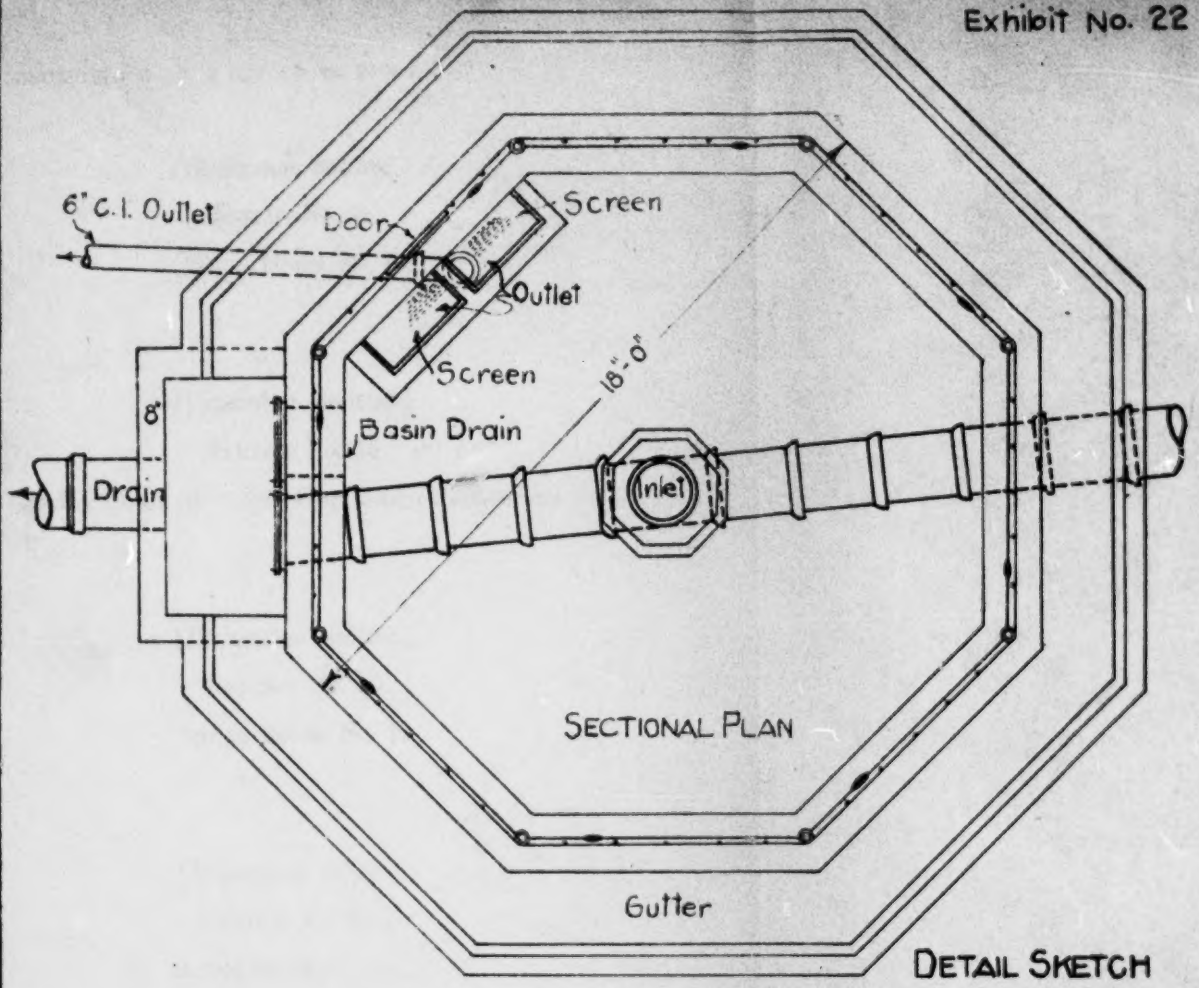
Spring House No. 1.

[Illustration omitted.]

EXHIBIT No. 17.

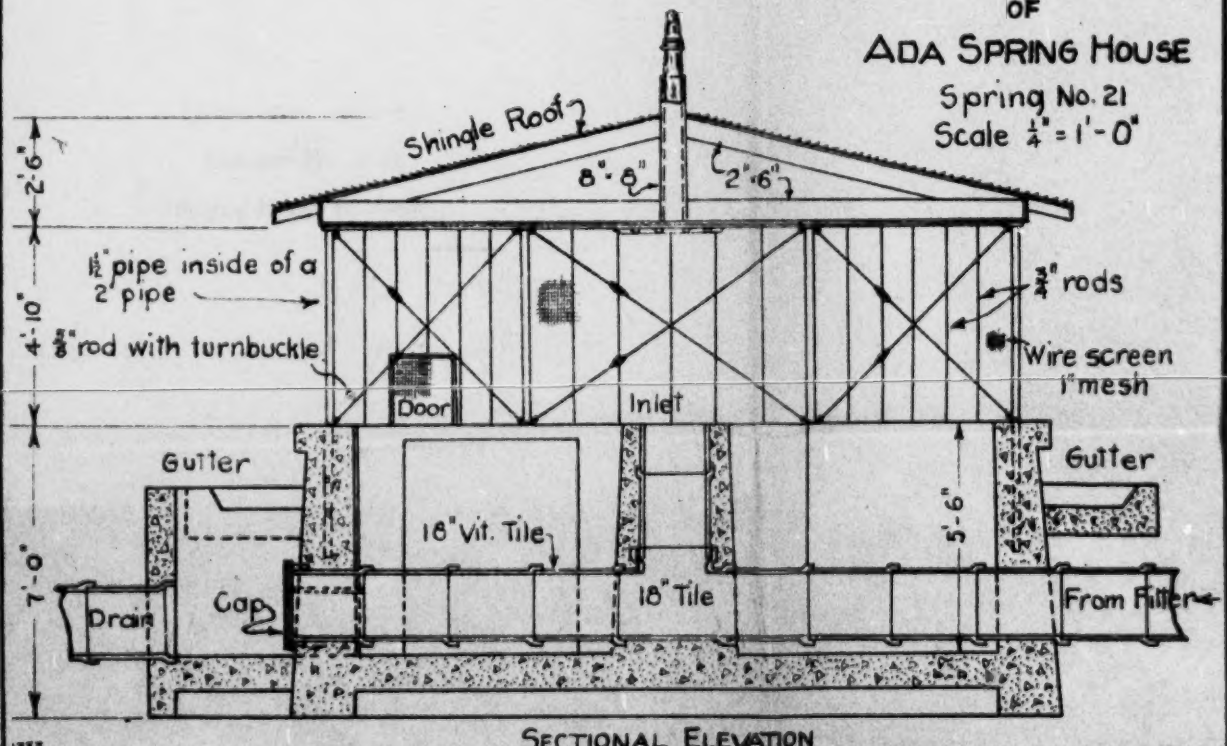
Spring House No. 6.

Exhibit No. 22



DETAIL SKETCH OF ADA SPRING HOUSE

Spring No. 21
Scale $\frac{1}{4}$" = 1'-0"



SECTIONAL ELEVATION

579 [Illustration omitted.]

EXHIBIT No. 18.

Spring House No. 7.

[Illustration omitted.]

EXHIBIT No. 19.

Spring House No. 9, Showing Rough Topography.

580 [Illustration omitted.]

EXHIBIT No. 20.

Spring House No. 11.

581 [Illustration omitted.]

EXHIBIT No. 21-A.

Spring House No. 18-A.

[Illustration omitted.]

EXHIBIT No. 21-B.

Spring House No. 18-B.

(Here follows Exhibit No. 22, marked page 582.)

583 [Illustration omitted.]

EXHIBIT No. 23-A.

Spring House at Ada Spring.

[Illustration omitted.]

EXHIBIT No. 23-B.

Spring House at Ada Spring.

584 [Illustration omitted.]

EXHIBIT No. 24.

Basin at Ada Spring.

[Illustration omitted.]

EXHIBIT No. 25.

Jarrell Spring.

585 [Illustration omitted.]

EXHIBIT No. 26.

Beaver Pond Spring.

[Illustration omitted.]

EXHIBIT No. 27.

Reservoir and Dam. Lower Side.

(Here follow Exhibits Nos. 28*a* and 28*b*, marked pages 586 and 587.)

CITY OF BLUEFIELD

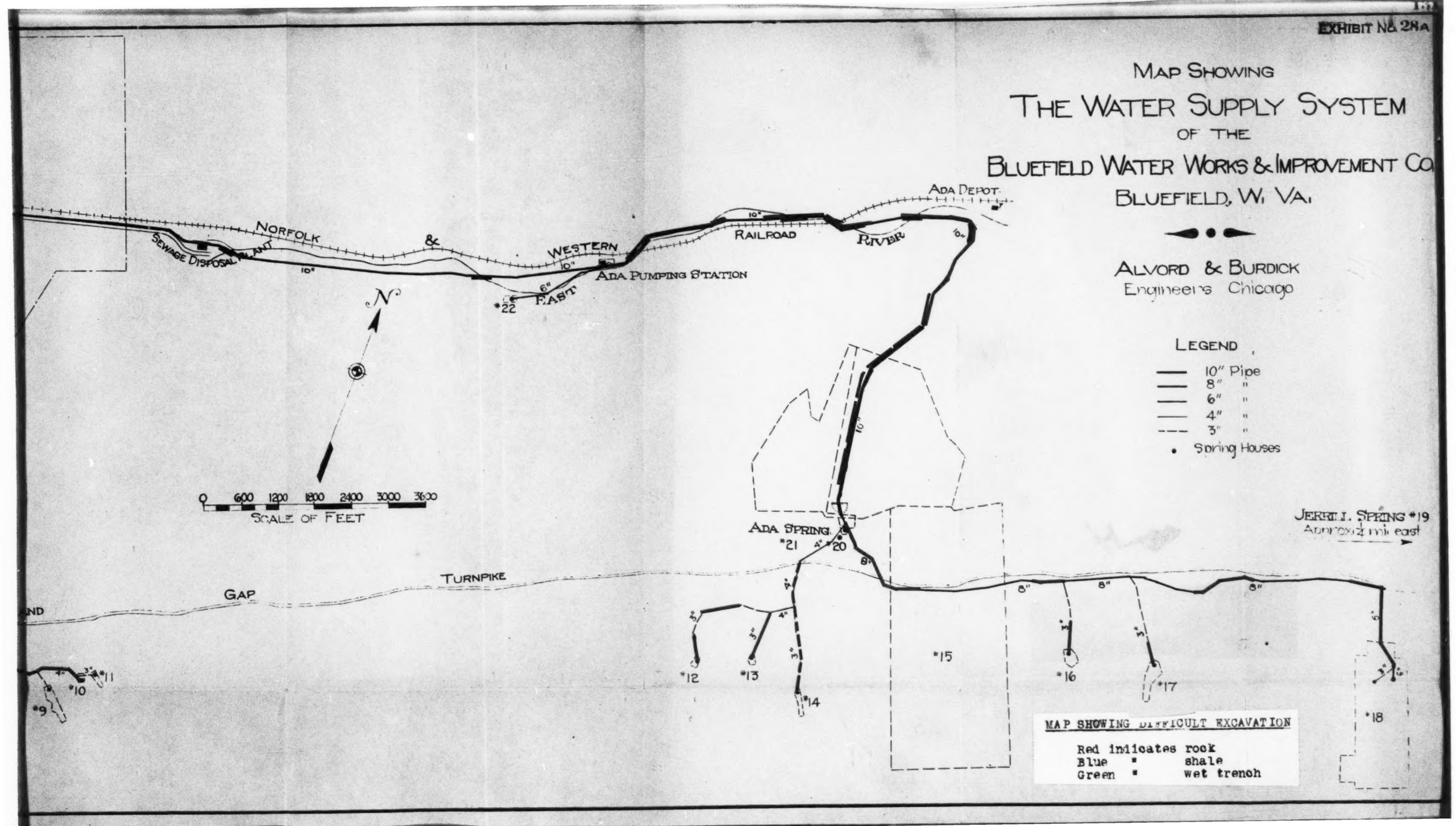
HILL AVE.
PULASKI ST.
ST.
HARDY ST.
WAYNE ST.
PRINCETON AVENUE
BLUEFIELD AVE.
ROGERS ST.
THIRD ST.
FOURTH ST.
HIGHLAND AVE.
CAROLINA AVE.
MERCER ST.
RALEIGH ST.
WYOMING ST.
LEE ST.
HIGH ST.
CALHOUN ST.
TANK
PENDLETON TER.
WHEELING AVE.
TWIN TANKS
SEWAGE DISPOSAL
ELLIS ST.
10" STREET
PRESTON AVE.
BOWYER ST.
ADAMS STREET
WYTHE AVE.
JEFFERSON ST.
BLAND ST.
CITY OF BLUEFIELD
CUMBERLAND GAP
BEAVER POND PUMPING STA.
BEAVER POND SPRING #23
#1
#2
#3
#4
#5
#6
#7 & #8
#9
#10
#11
6"
8"
10"
4"
3"
2"

1329

EXHIBIT NO 28A

MAP SHOWING
THE WATER SUPPLY SYSTEM
OF THE
BLUEFIELD WATER WORKS & IMPROVEMENT CO
BLUEFIELD, W. VA.

ALVORD & BURDICK
Engineers Chicago



LEGEND

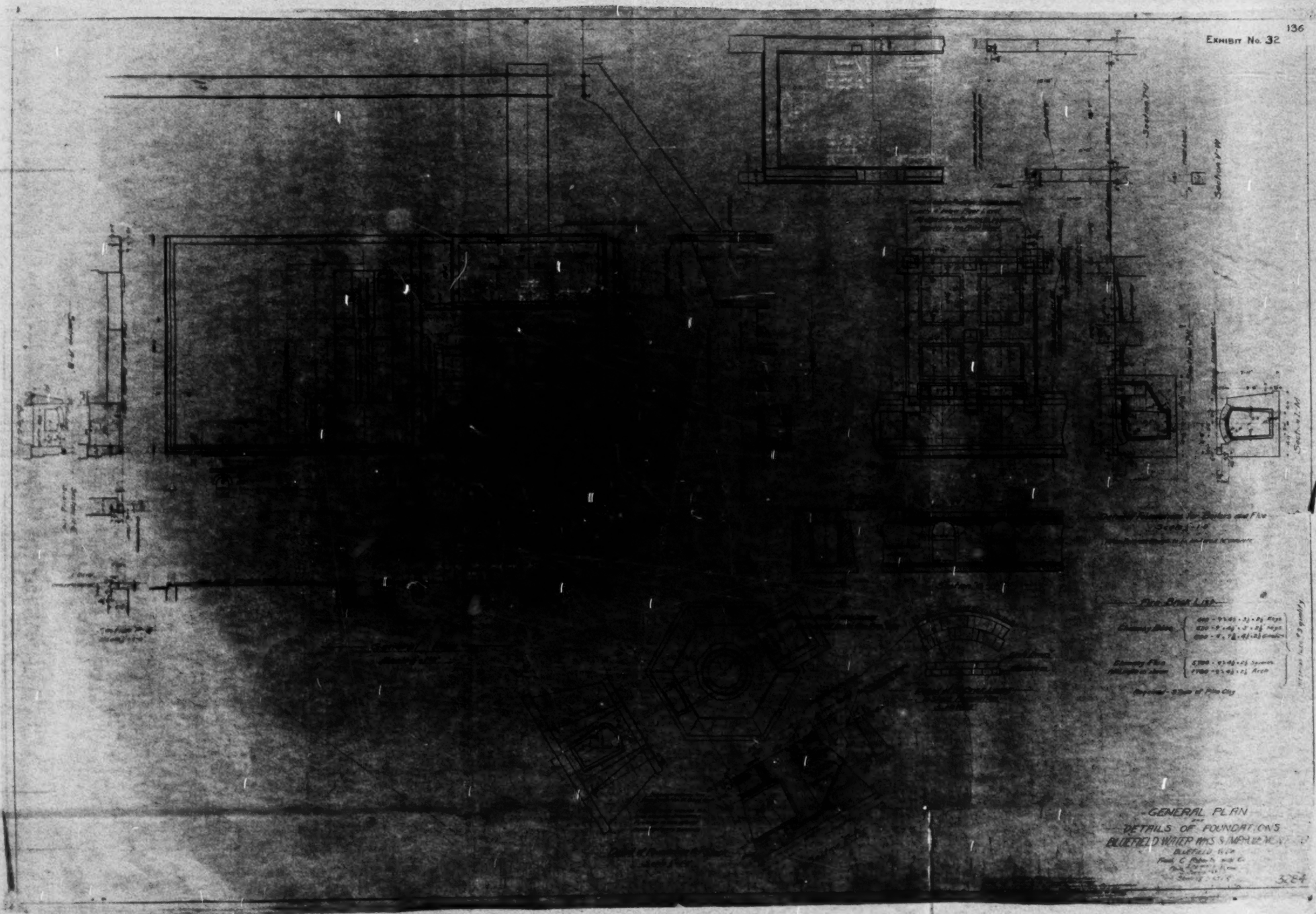
- 10" Pipe
- 8" "
- 6" "
- 4" "
- 3" "
- Spring Houses

MAP SHOWING DIFFICULT EXCAVATION

Red indicates rock
Blue " shale
Green " wet trench

DIAGRAM SHOWING
PRINCIPAL ELEVATIONS
OF THE
BLUEFIELD WATER WORKS SYSTEM

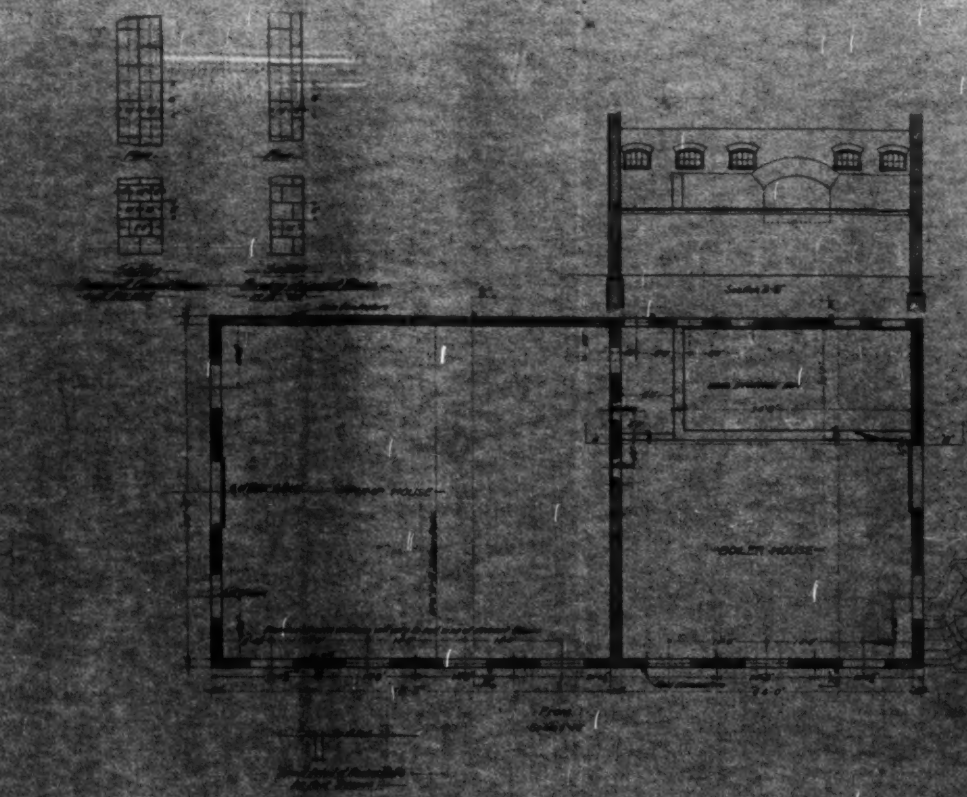
EXHIBIT No. 32

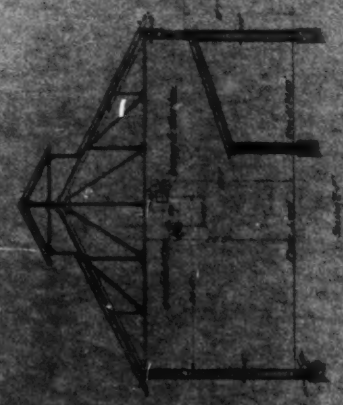


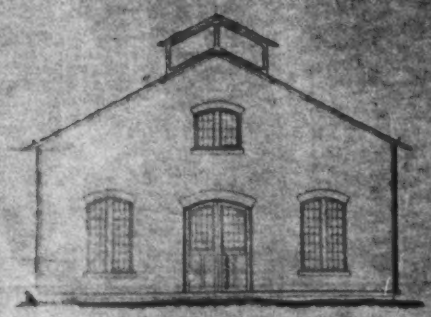
GENERAL PLAN
DETAILS OF FOUNDATIONS
BLUEFIELD WATER WKS & SEWERAGE CO.
BLUEFIELD W.VA.

3264

137
Exhibit No. 33







PUMP AND BOILER HOUSE
BLUEFIELD WATER WKS. & IMPROVEMENT CO.
BLUEFIELD W. VA.
Frank C. Roberts & Co.
Engrs.
3236

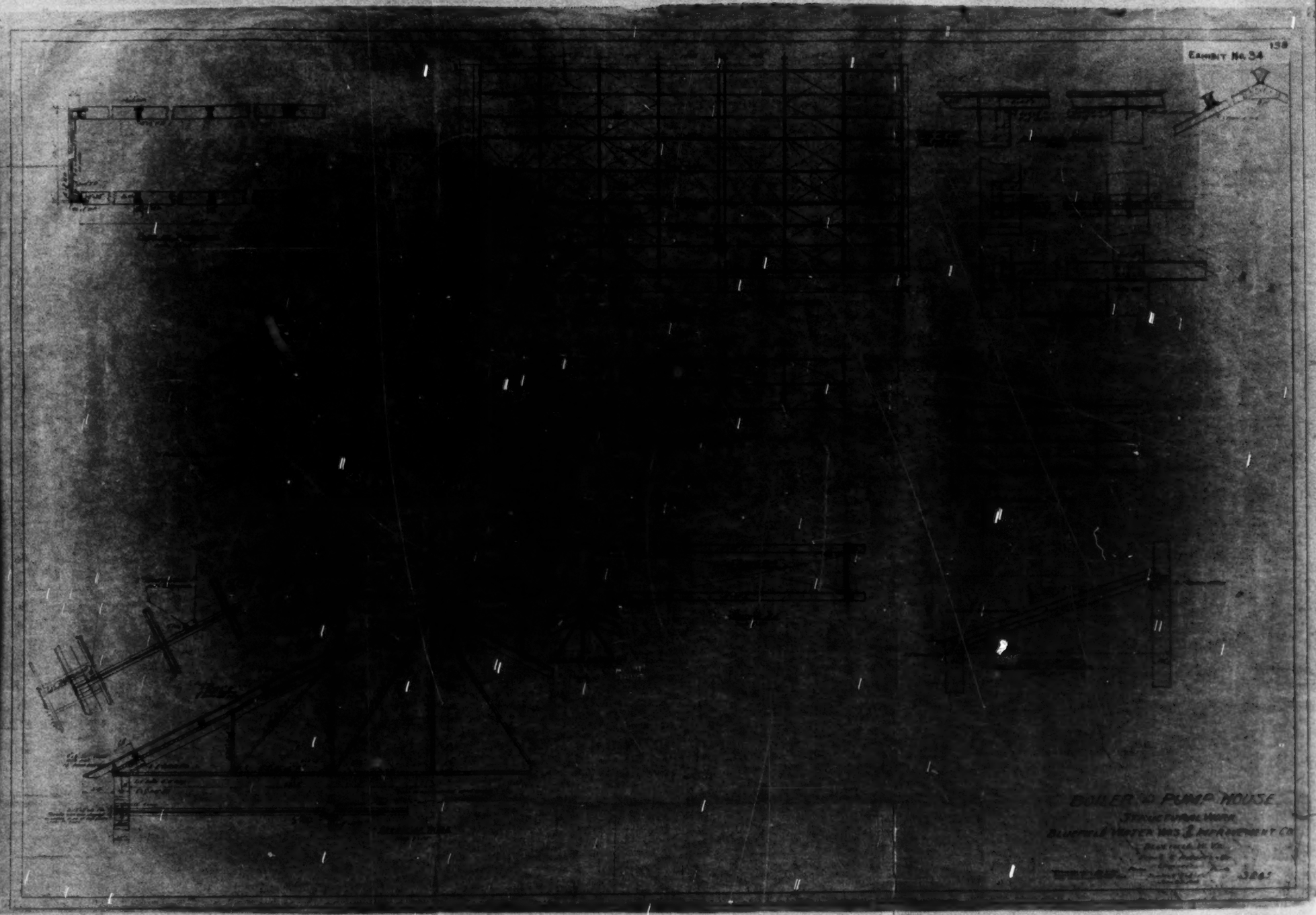


Exhibit No. 34
BOILER & PUMP HOUSE

588 [Illustration omitted.]

EXHIBIT No. 29.

View Along Route of Gravity Pipe Line.

589 [Illustration omitted.]

EXHIBIT No. 30-A.

View Along Route of Ada Pipe Line Showing Rock.

[Illustration omitted.]

EXHIBIT No. 30-B.

Crossing under N. & N. W. R. R., on the Ada Pipe Line.

(Here follow Exhibits Nos. 31, 32, 33, and 34, marked pages 590, 591, 592, and 593.)

594 [Illustration omitted.]

EXHIBIT No. 35.

Construction View, Ada Pumping Station.

[Illustration omitted.]

EXHIBIT No. 36.

Ada Pumping Station.

595 [Illustration omitted.]

EXHIBIT No. 37.

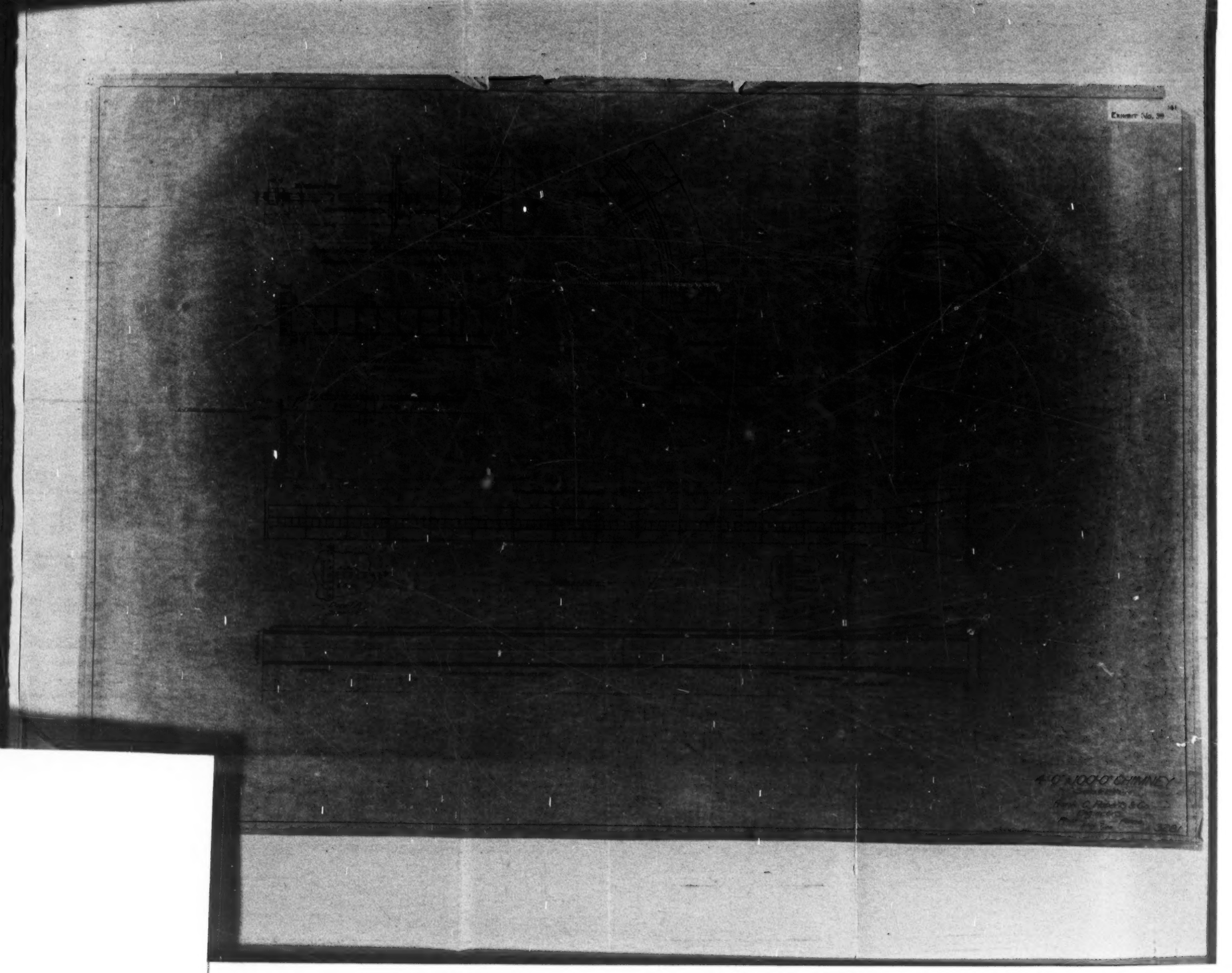
End View of Ada Pumping Station, Showing Coal Chute & Retaining Wall.

[Illustration omitted.]

EXHIBIT No. 38.

Coal Bin in Ada Pumping Station.

(Here follows Exhibit No. 39, marked page 596.)


4'-0" x 100'-0" CHIMNEY

PIPING & IMPROVEMENTS IN STATION YARD

ADA PUMPING STATION

Scale 1" = 20'-0"

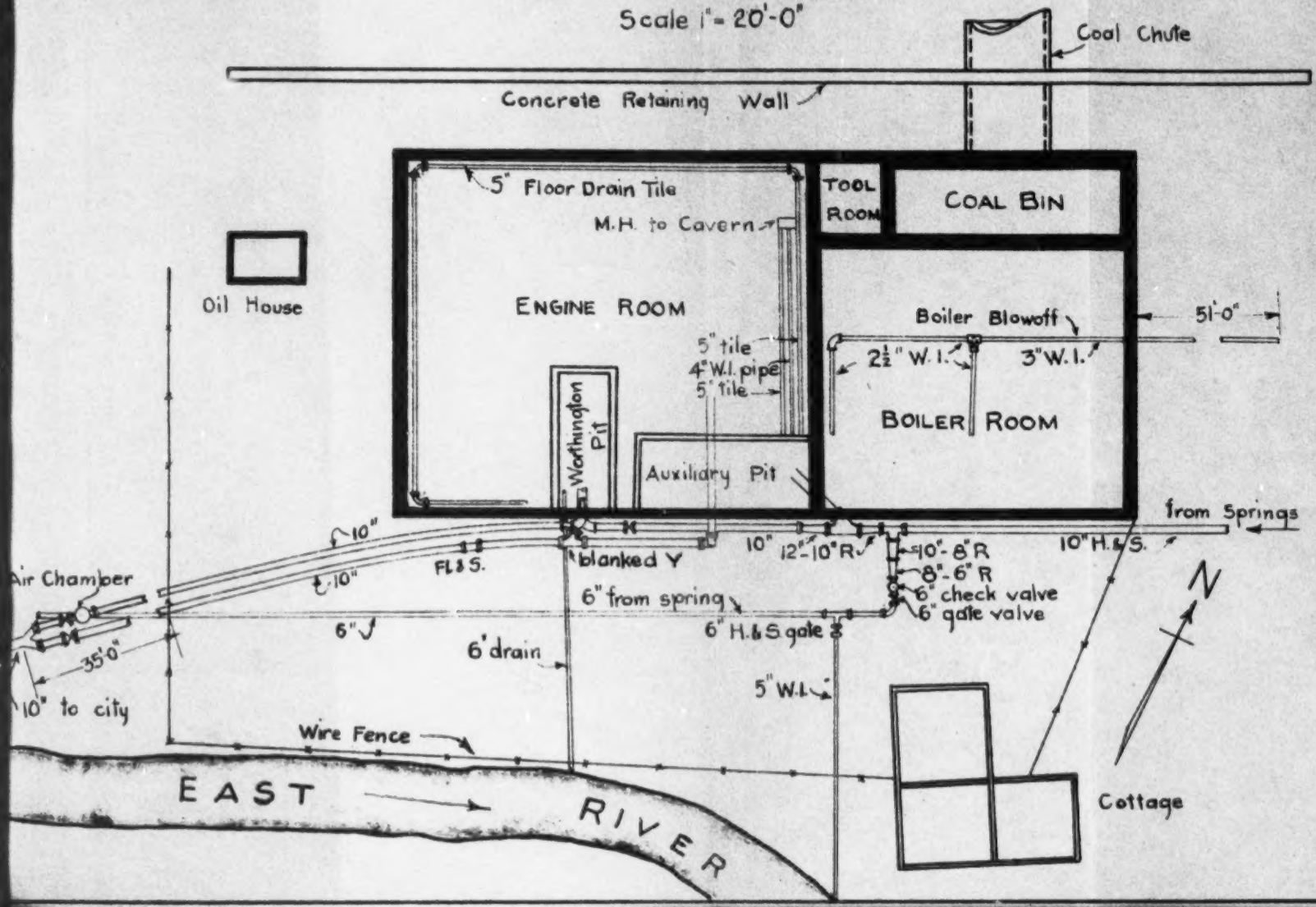


Exhibit No. 45

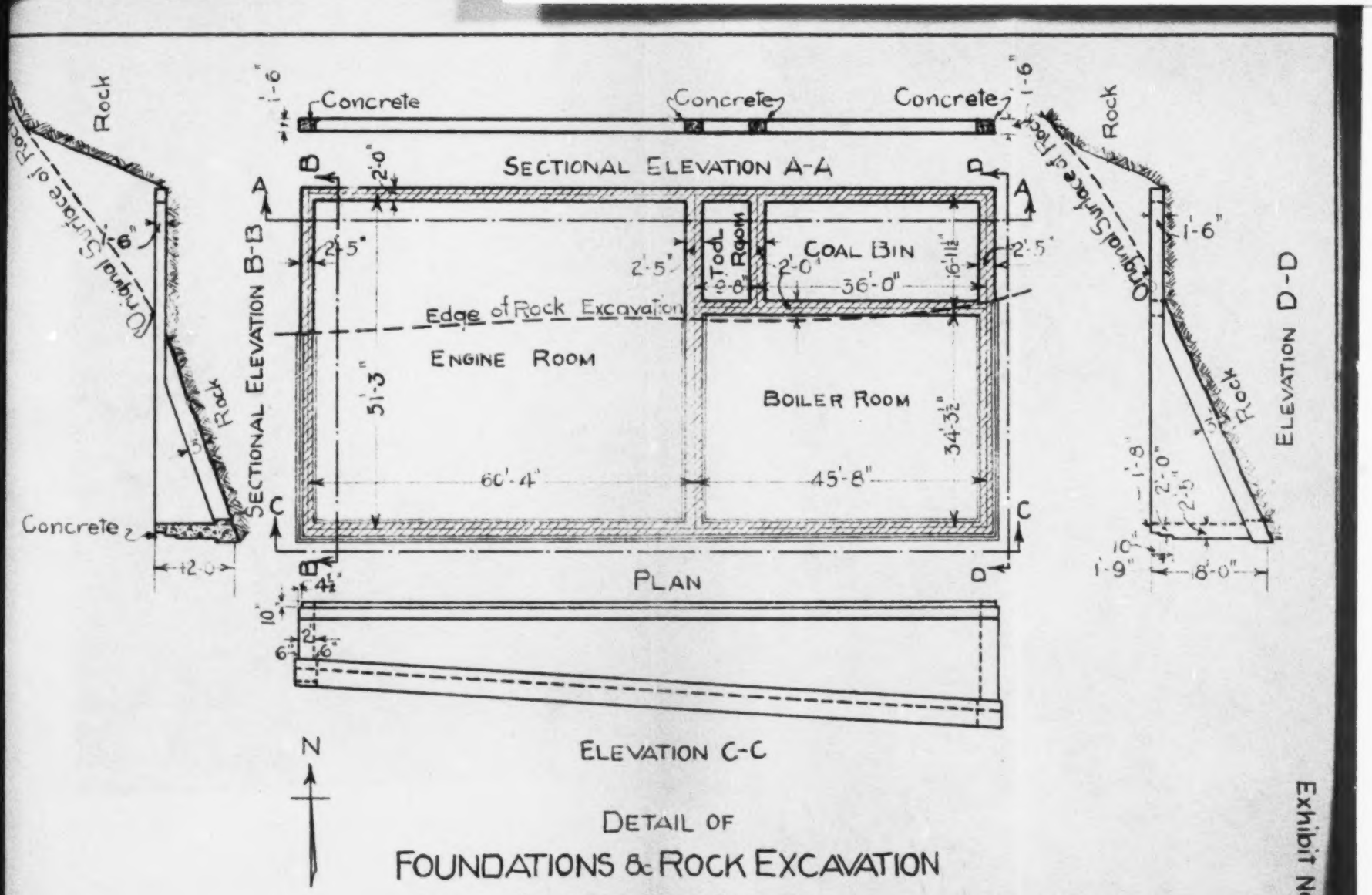
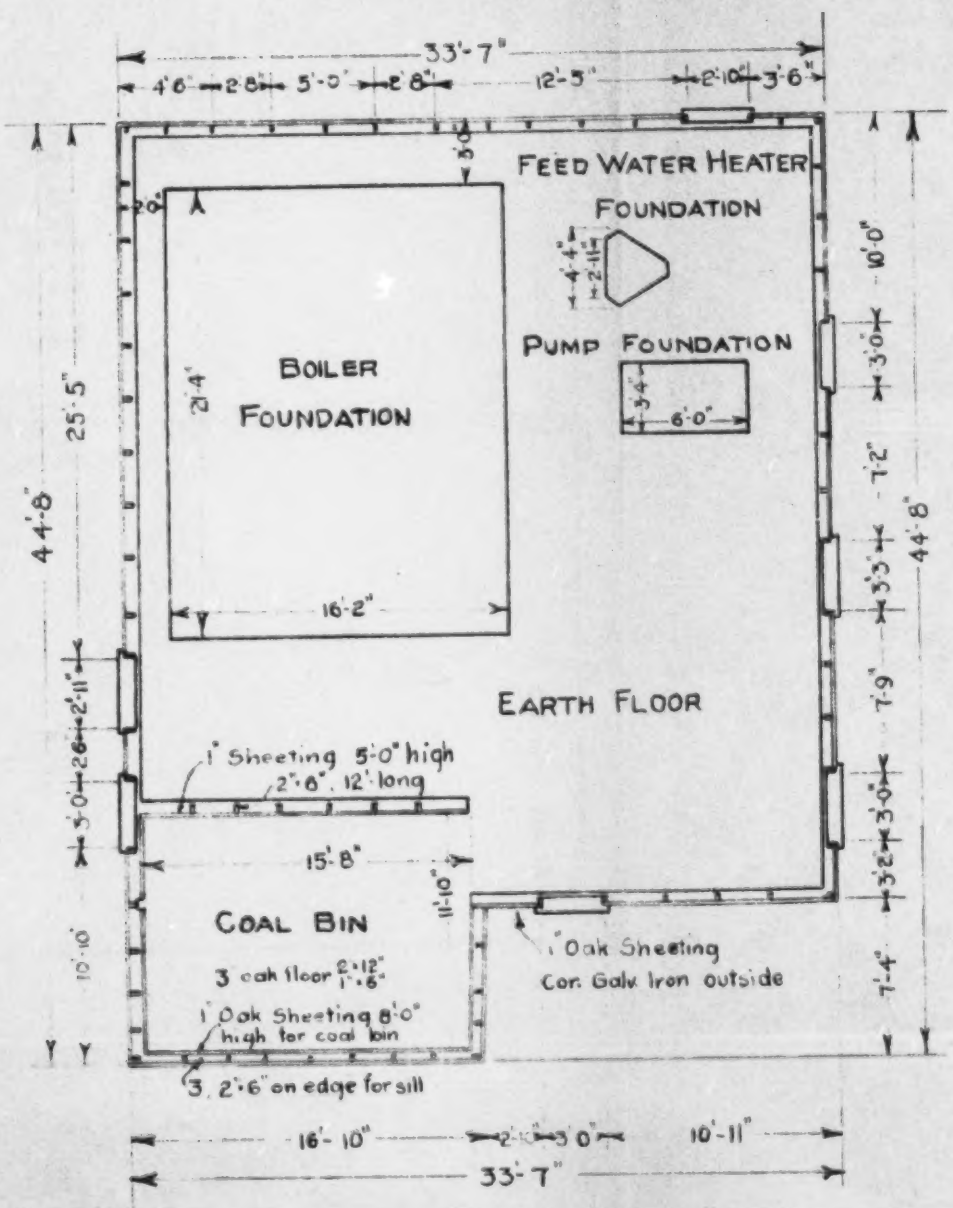

Concrete
Concrete
Concrete
1'-6"
SECTIONAL ELEVATION A-A
2'-0"
2'-5"
2'-5"
Tool Room
8"
COAL BIN
2'-0"
36'-0"
6'-11½"
2'-5"
Edge of Rock Excavation
ENGINE ROOM
BOILER ROOM
51'-3"
34'-3½"
60'-4"
45'-8"
SECTIONAL ELEVATION B-B
PLAN
4½"
10"
6"
2"
6"
ELEVATION C-C
Rock
Original Surface of Rock
6"
Rock
Concrete
12'-0"
Rock
Original Surface of Rock
1'-6"
Rock
1'-8"
2'-0"
2'-5"
1'-9"
8'-0"
ELEVATION D-D
N
DETAIL OF
FOUNDATIONS & ROCK EXCAVATION
ADA PUMPING STATION
Scale 1"=20'-0"
Exhibit No. 31

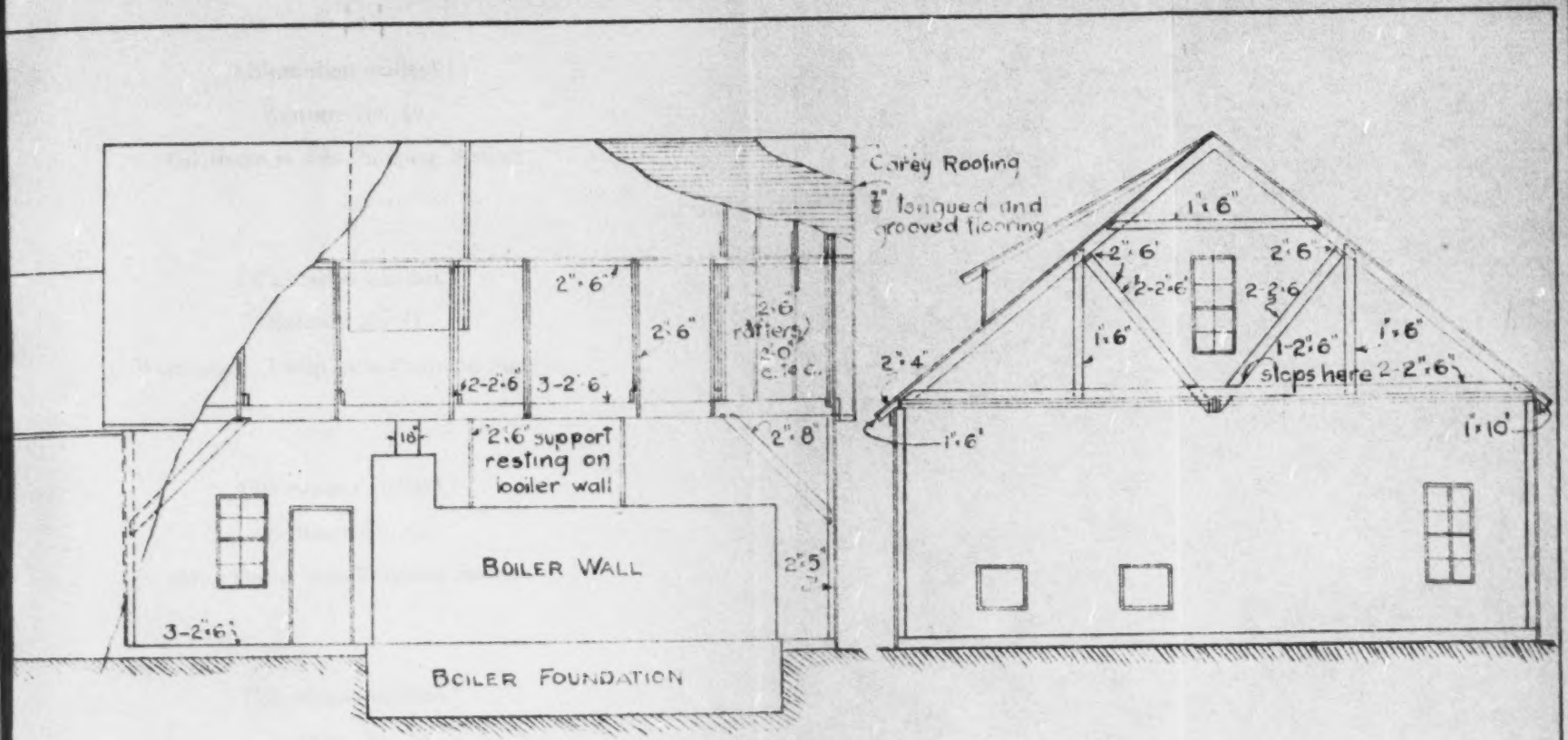
Exhibit No. 46

FLOOR PLAN

BEAVER POND PUMPING STATION

Scale $\frac{1}{8}$" = 1'-0"





SECTIONAL ELEVATIONS
OF
BEAVER POND PUMPING STATION
Scale ⅛" = 1'-0"

Exhibit No. 47

597 [Illustration omitted.]

EXHIBIT No. 40.

Oil House at Ada Pumping Station.

[Illustration omitted.]

EXHIBIT No. 41.

Worthington Pump, Ada Pumping Station.

598 [Illustration omitted.]

EXHIBIT No. 42.

Snow Pump, Ada Pumping Station.

[Illustration omitted.]

EXHIBIT No. 43.

Snow Pump, Ada Pumping Station.

599 [Illustration omitted.]

EXHIBIT No. 44.

Boiler Setting, Ada Pumping Station.

(Here follow Exhibits Nos. 45, 46, and 47, marked pages 600, 600*a*, and 600*b*.)

601 [Illustration omitted.]

EXHIBIT No. 48.

Beaver Pond Pumping Station. View from the Southwest.

[Illustration omitted.]

EXHIBIT No. 49.

Beaver Pond Pumping Station. View from the Southeast.

602 [Illustration omitted.]

EXHIBIT No. 50.

View from the West, Beaver Pond Pumping Station.

(Here follows Exhibit No. 51, marked page 603.)

Exhibit No. 51

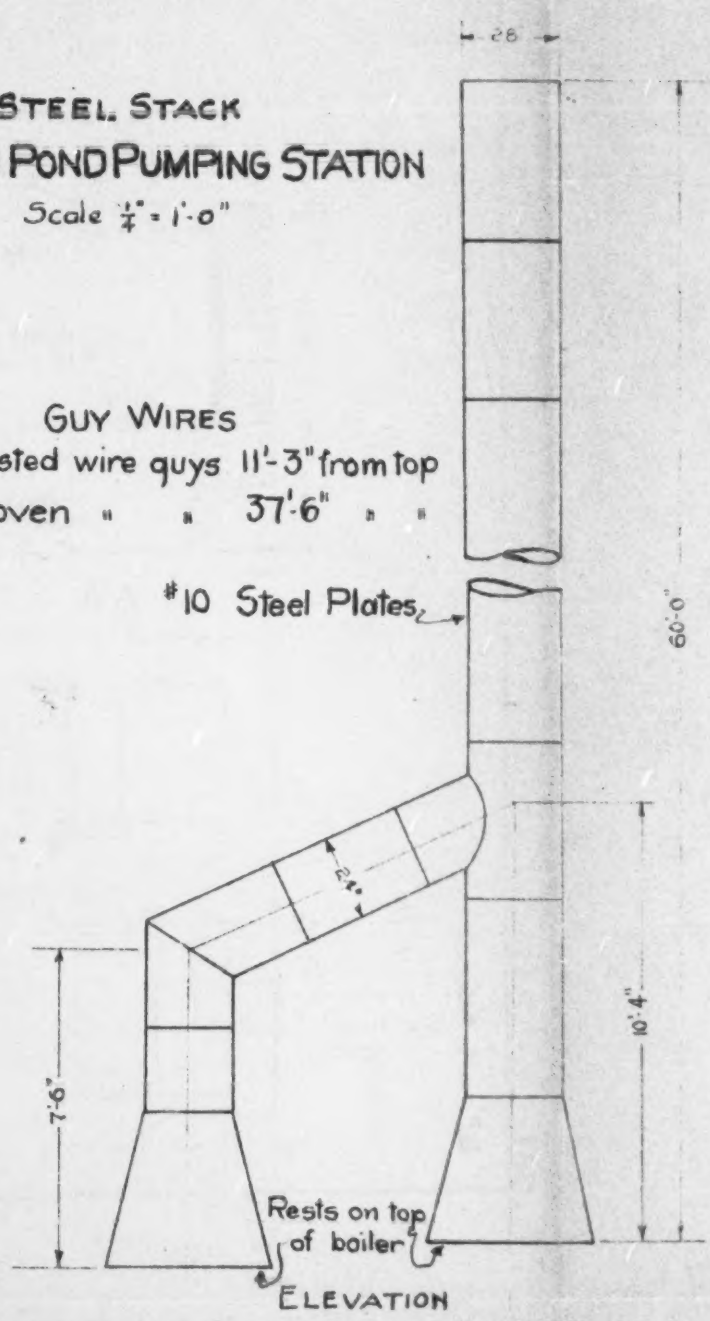
STEEL STACK
BEAVER POND PUMPING STATION

Scale $\frac{1}{4}$" = 1'-0"

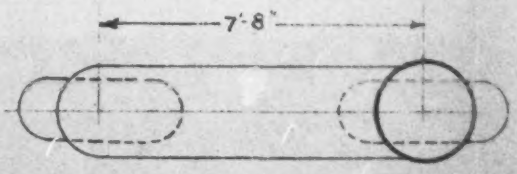
GUY WIRES

4-$\frac{3}{8}$" twisted wire guys 11'-3" from top

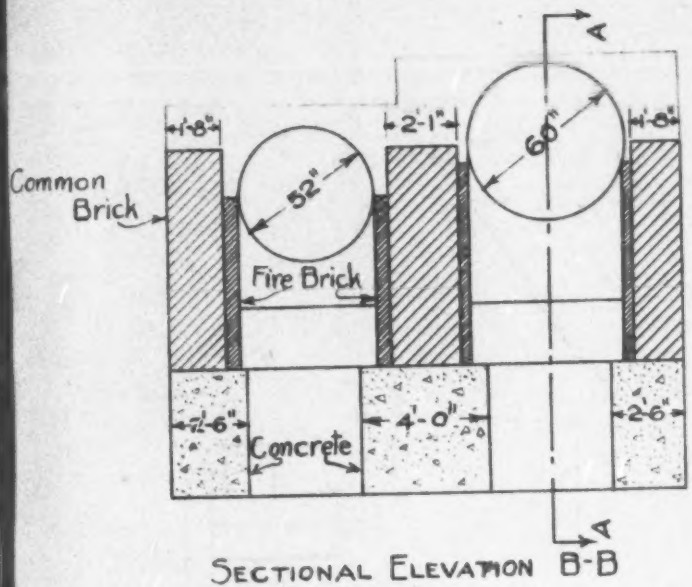
4-$\frac{3}{8}$" woven " " 37'-6" " "



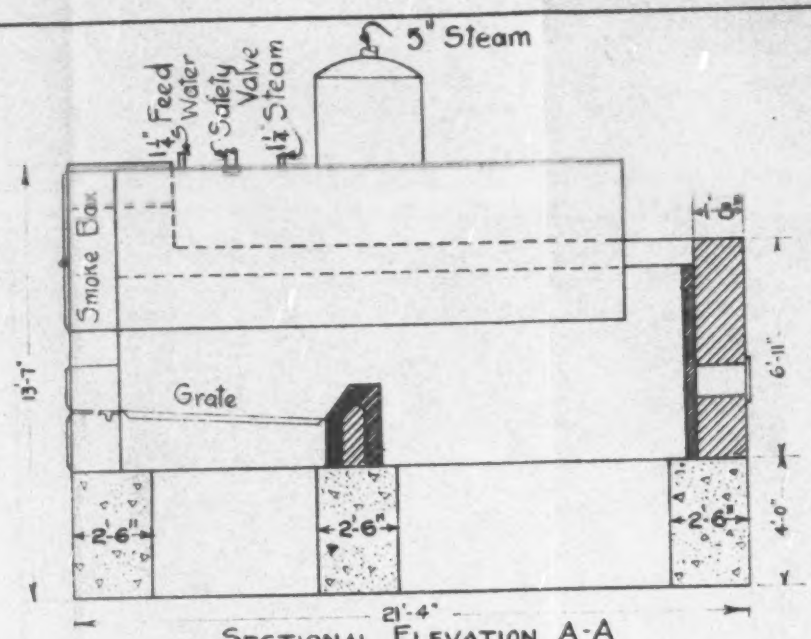
ELEVATION



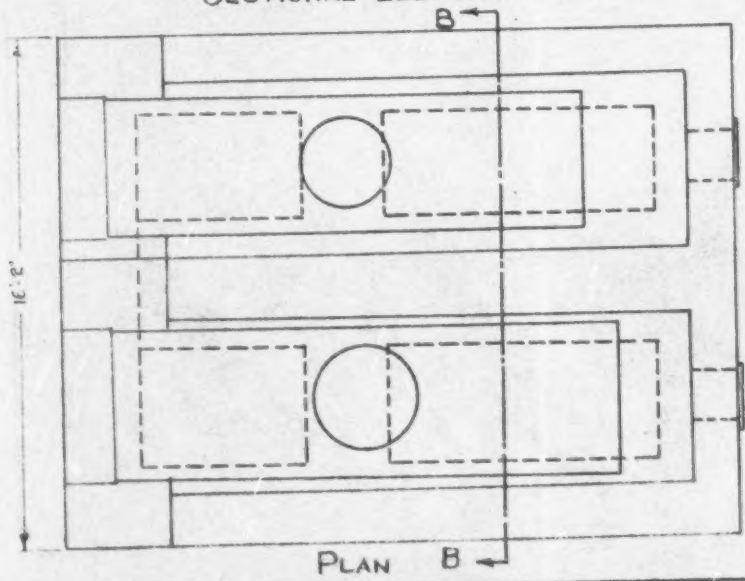
SECTIONAL PLAN



SECTIONAL ELEVATION B-B



SECTIONAL ELEVATION A-A



PLAN

20"x12" C.I. Clean out frame and door

BOILER SETTINGS

BEAVER POND PUMPING STATION

Scale $\frac{3}{16}$" = 1'-0"

Exhibit No. 54

PIPING & IMPROVEMENTS IN STATION YARD

BEAVER POND PUMPING STATION

Scale 1"=40'

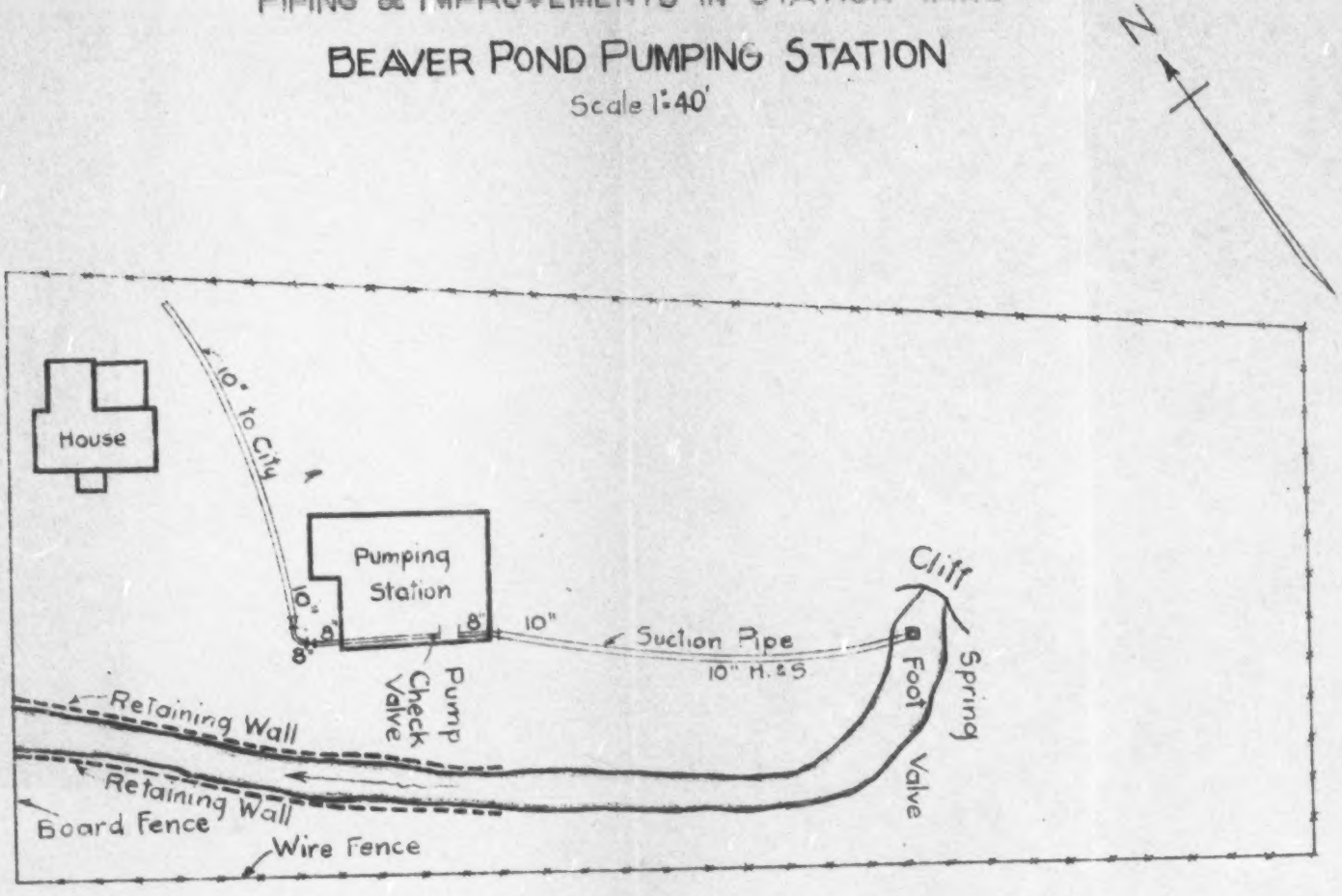
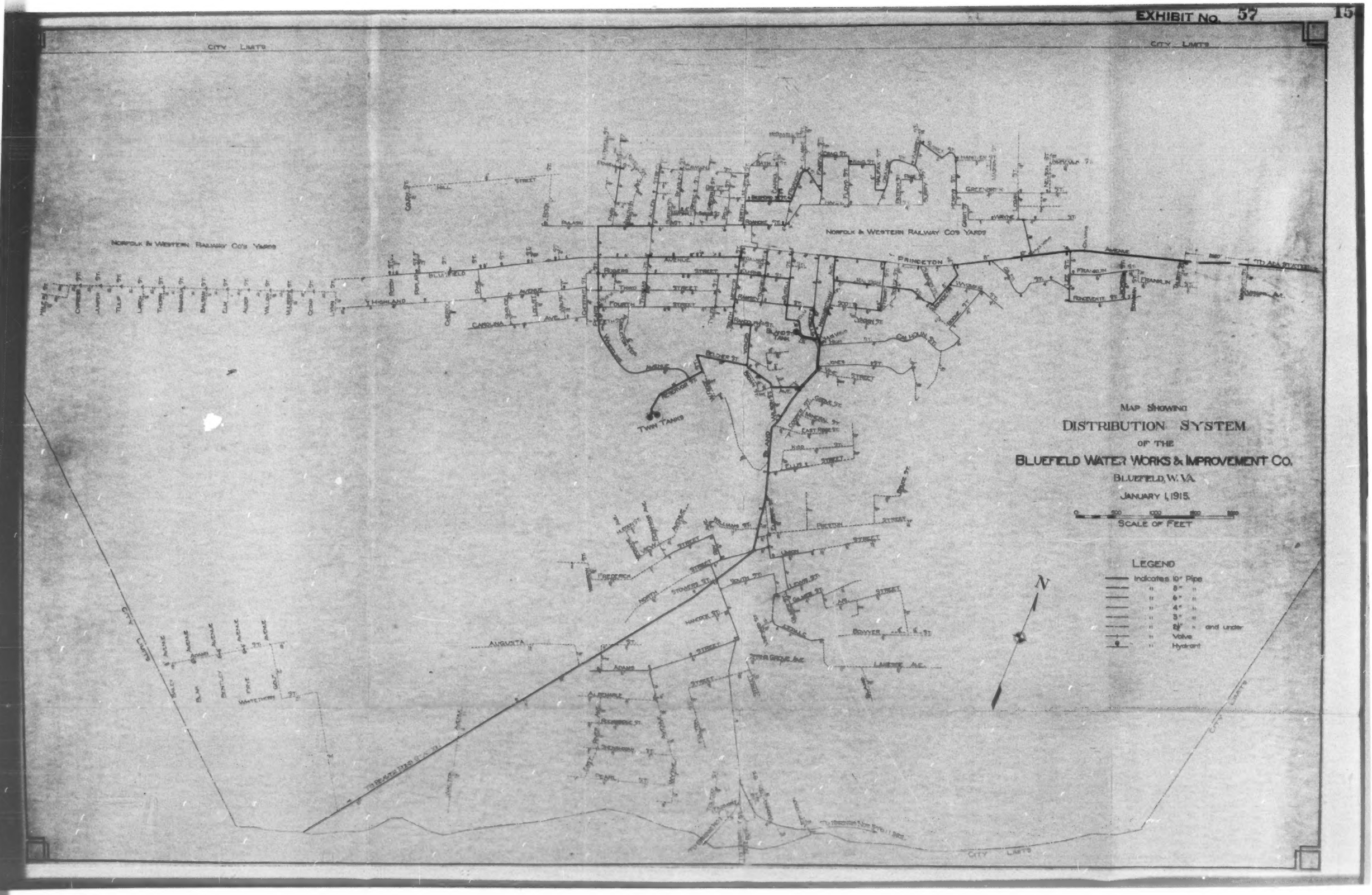


Exhibit No. 55


CITY LIMITS
NORFOLK & WESTERN RAILWAY CO'S YARDS
BLUEFIELD
HIGHLAND AVE.
CAROLINA AVENUE
PRINCETON
ROGERS
THIRD
FOURTH
STREET
AVENUE
CALHOUN ST.
TWIN TANKS
AUGUSTA
ADAMS
ALDERSON
LAWRENCE AVE.
MAP SHOWING
DISTRIBUTION SYSTEM
OF THE
BLUEFIELD WATER WORKS & IMPROVEMENT CO.
BLUEFIELD, W. VA.
JANUARY 1, 1915.
SCALE OF FEET
LEGEND
Indicates 10" Pipe
8"
6"
4"
3"
2" and under
Valve
Hydrant
N

604 [Illustration omitted.]

EXHIBIT No. 52.

Worthington Pump, Beaver Pond Pumping Station.

[Illustration omitted.]

EXHIBIT No. 53.

Boiler Setting, Beaver Pond Pumping Station.

(Here follow Exhibits Nos. 54, 55, and 57, marked pages 605, 606, and 607.)

608 EXHIBIT No. 58.

Itemized List of Street Mains, Showing Location, Size, and Length.

(a) 10" Cast Iron Mains.

On—	From—	To—	Length.
Princeton Ave.....	Market St.....	Giles St.	4,870'
Bland St.....	Ramsey St.....	North St.	3,310'
" "	Main	Curb	40'
Through Lots.....	North St.....	Walton Ave.	4,480'
Genoa St.....	Bland St.....	Genoa St.	830'
Belcher St.....	Genoa St.....	Ridge St.	670'
Ridge St.....	Belcher St.....	Reservoir St.	230'
Reservoir St.....	Ridge St.....	Twin Tanks	920'
			15,350'

(b) 8" Cast Iron Mains.

Princeton Ave.....	Giles St.....	Monroe St.	750'
Monroe St.....	Princeton Ave.....	Raleigh St.	620'
Raleigh St.....	Monroe St.....	Higgenbotham Ave.	1,330'
Higginbotham Ave..	Princeton Ave.....	Bland St.	1,150'
In Alley.....	Bland St. Tank....	Russell St.	360'
Russell St.....	Alley	Duhring St.	530'
Ramsey St.....	Russell St.....	Bland St.	350'
Duhring St.....	Russell St.....	Mercer St.	670'
Mercer St.....	Duhring St.....	Bluefield Ave.	200'
"	Bluefield Ave.....	Princeton St.	110'
Genoa St.....	Belcher St.....	Randolph St.	510'
Randolph St.....	Genoa St.....	Mercer St.	250'
Mercer St.....	Randolph St.....	Fourth St.	300'
Bluefield Ave.....	Mercer St.....	Thomas St.	1,160'
Wheeling Ave.....	Reservoir St.....	Pearis St.	1,520'
Pearies St.....	Wheeling Ave.....	Pulaski St.	1,340'
Pulaski St.....	Pearis St.....	Allen St.	680'
			11,840'

(c) 6" Cast Iron Mains.

Jackson St.....	Franklin St.....	Roncreverte St.	350'
Ronceverte St.....	Jackson St.....	Lee St.	720'
Lee St.....	Ronceverte St.....	Princeton Ave.	630'
Franklin St.....	Jackson St.....	Lee St.	720'
Railroad Crossing..	Princeton Ave.....	Wayne St.	465'
Stub on Princeton..	Near Lee.....	Railroad	20'

609

Wayne St.....	Crossing	Logan St.	60'
Henry St.....	Arlenbrier St.....	Hanover St.	400'
Sussex St.....	Hanover St.....	Warren St.	590'
Warren St.....	Sussex St.....	Orange St.	300'
Orange St.....	Warren St.....	Halifax St.	720'
Halifax St.....	Orange St.....	King St.	450'
King St.....	Halifax St.....	Floyd St.	330'
Floyd St.....	King St.....	Craig St.	100'
Craig St.....	Floyd St.....	Fairfax St.	350'
Fairfax St.....	Craig St.....	Roanoke St.	440'
Roanoke St.....	Fairfax St.....	Bedford St.	790'
Bedford St.....	Roanoke St.....	Mercer St.	610'

EXHIBIT No. 58—Continued.

On—	From—	To—	Length.
Carrol St.....	Bedford St.....	North	190'
Roanoke St.....	Roanoke St.....	Mercer St.	550'
Mercer St.....	"	Bedford St.	280'
Pulaski St.....	Mercer St.....	Allen St.	1,190'
Pulaski St.....	Stub	Near Peck	20'
Allen St.....	Pulaski St.....	Lawson St.	740'
Park St.....	Alley	Powell St.	450'
Scott St.....	Raleigh St.....	Princeton Ave.	120'
Stewart St.....	Scott St.....	Princeton Ave.	615'
Princeton Ave.	Stewart St.....	Bland St.	830'
Bland St.....	Princeton Ave.....	Ramsey St.	670'
Scott St.....	Stewart St.....	Alley	320'
Tazewell St.....	Duhring St.....	Princeton Ave.	340'
Russell St.....	"	"	320'
Ramsey St.....	Mercer St.....	Russell St.	690'
Mercer St.....	Ramsey St.....	Duhring St.	330'
Bland St.....	Higginbotham St...	High St.	70'
Bland St.....	" ...	Genoa St.	700'
Fourth St.....	Pearles St.....	Mercer St.	1,140'
Rogers St.....	"	"	1,790'
Bluefield Ave.....	W. of Beech St.....	Thomas St.	3,340'
Tyler St.....	Rogers St.....	Fourth St.	415'
Thomas St.....	" "	"	420'
Thomas St.....	Bluefield St.....	North	40'
Bluefield St.....	Stub	.....	40'
Beech St.....	Bulefield St.....	North	40'
Ellis St.....	Bland St.....	East	300'
Union St.....	"	"	620'
Bland St.....	Preston St.....	Union St.	310'
North St.....	Bland St.....	W. of Jefferson.....	930'
Bland St.....	Lewis St.....	Bowyer St.	1,050'
Roy Ave.....	Frederick St.....	North St.	320'
Jefferson St.....	North St.....	Adams St.	1,010'
Adams St.....	Jefferson St.....	E of East River Ave.....	1,990'
East River Ave....	At Adams.....	.....	30'
Golf Ave.....	" "	.....	24'
Frye Ave.....	" "	.....	24'
Bentley Ave.....	" "	.....	24'
Blair Ave.....	" "	.....	24'
Bailey Ave.....	" "	.....	24'
Frederick St.....	Roy Ave.....	Penn-Mar Ave.	630'
610			
Wythe Ave.....	Adams St.....	Albermarle St.	430'
Albemarle St.....	At Wythe Ave.....	.....	40'
			31,475'

(d) 4" Cast Iron Mains.

South St.....	Jefferson St.....	Bland St.	720'
Bland St.....	South St.....	Lewis St.	300'
Lewis St.....	Bland St.....	East	195'
Alley	Lewis St.....	Union St.	430'
Gilmer St.....	"	Earle St.	830'
Ellis St.....	Bland St.....	Alley	180'
High St.....	"	Charleston Ter.	1,950'
Lot $13.....	Charleston Ter.....	Boone St.	180'

EXHIBIT No. 58—Continued.

On—	From—	To—	Length.
Boone St.	Lot #13.	Wyoming St.	630'
Wyoming St.	Monroe St.	Charleston Ter.	770'
Giles St.	Princeton Ave.	Lee St.	1,300'
Wayne St.	Grant St.	Lincoln St.	960'
Logan St.	Wayne St.	Greenbrier St.	360'
Greenbrier St.	Lincoln St.	Henry St.	1,390'
Surrey St.	Orange St.	Hardy St.	520'
Hardy St.	Surry St.	Roanoke St.	1,890'
"	Stub to R. R.	At Floyd	20'
"	2 stubs to R. R.	At Roanoke	20'
Bath St.	Mercer St.	Carroll St.	360'
Mercer St.	Lawson St.	"	430'
Lawson St.	Mercer St.	Allen St.	1,145'
Bayer St.	Davidson St.	Peck St.	90'
Marshall St.	Reese St.	Burton St.	300'
Reese St.	Pulaski St.	Lawson St.	710'
Beasley St.	Marshall St.	"	535'
Burton St.	Pulaski St.	North	320'
Barger St.	"	"	20'
Baldwin St.	"	"	30'
Park Ave.	"	Alley	290'
Pulaski St.	R. R. Crossing.	Rock St.	740'
Princeton Ave.	Monroe St.	Stewart St.	870'
Princeton Ave.	Bland St.	Mercer St.	1,065'
Mercer St.	Princeton Ave.	Bluefield Ave.	140'
Princeton Ave.	Stub	At Russell St.	40'
Railroad Crossing.	Princeton Ave.	Near Mercer St.	370'
Third Street.	Chestnut St.	Tyler St.	1,680'
Thomas St.	Rogers St.	Pulaski St.	630'
Fourth St.	Thomas St.	Tyler St.	240'
Chestnut St.	Rogers St.	Carolina Ave.	560'
Rogers Street.	Pearis St.	Chestnut St.	180'
Carolina Ave.	Walnut St.	"	280'
Highland Ave.	Chestnut St.	Lynn St.	3,040'
Pine St.	Highland Ave.	Bluefield Ave.	370'
Spruce St.	At Highland Ave.		24'
Maple St.	" " "		12'
Jones St.	Bland St.	East	1,280'
			28,336'

611 3" Cast Iron Mains.

Carolina Ave.	Cherry St.	Walnut St.	1,250'
Davidson St.	Bayer St.	Day St.	320'
Day St.	Peck St.	West	300'
Peck St.	Pulaski St.	Day St.	450'
Bedford St.	Peck St.	Mercer St.	210'
Mercer St.	Bedford St.	Lawson St.	350'
Carroll St.	"	Bath St.	440'
Bedford St.	Mercer St.	Roanoke St.	590'
Roanoke St.	Roanoke St.	Clarke St.	810'
Clarke St.	McDowell St.	Roanoke St.	420'
Fairfax St.	Hardy St.	"	160'
Floyd St.	"	King St.	500'
Orange St.	"	Halifax St.	190'
Patrick St.	"	Page St.	320'
Page St.	Patrick St.	Surry St.	280'
Henry St.	Hardy St.	Greenbrier St.	150'

EXHIBIT No. 58—Continued.

On—	From—	To—	Length.
Hardy St.....	Henry St.....	Grant St.	145′
Grant StN.....	Hardy St.	Wayne St.	180′
Wayne St.....	Grant St.....	East	300′
Scott St.....	Princeton Ave.....	Higginbotham Ave.	940′
Summers St.....	"	Monroe St.	470′
Ronceverte St.....	Jackson St.....	East	230′
Fourth St.....	Thomas St.....	Tyler St.	360′
Hanover St.....	Halifax St.....	Madison St.	440′
Madison St.....	Hanover St.....	South	120′
Tazewell St.....	Duhring St.....	Ramsen St.	340′
Poplar St.....	Bluefield Ave.....	North	230′
Total			10,495′

Total Cast Iron Mains.

15,350	lineal	feet	of 10"	mains.
11,840	"	"	" 8"	"
31,475	"	"	" 6"	"
28,336	"	"	" 4"	"
10,495	"	"	" 3"	"
97,496	"	"	Total Cast Iron Mains.	

612 (b) 2½" Galvanized Iron Mains.

Poplar St.....	Bluefield Ave.....	North	220′
Total			220′

2" Galvanized Iron Mains.

Walnut St.....	Bluefield Ave.....	North	180′
Wythe Ave.....	Shenandoah ...	Pearl St.	410′
Pearl St.....	Wythe Ave.....	East River Ave.....	710′
Shenandoah St.....	"	West	500′
Golf Ave.....	Adams St.....	Whitethorn St.	690′
Whitethorn St.....	Golf Ave.....	Country Club	460′
Total			2,950′

1½" Galvanized Iron Mains.

Locust St.....	Highland Ave.....	Carolina Ave.	500′
Walnut St.....	"	"	150′
Couch St.....	Hill Ave.....	South	270′
Hill Ave.....	Couch St.....	Rorer St.	1,930′
Rock St.....	Pulaski St.....	Hill Ave.	630′
Pendleton Ter.....	Fifth St.....	Hinton St.	580′
Alley	Rogers St.....	Third St.	210′
Clarke St.....	McDowell St.....	North	140′
McDowell St.....	Clarke St.....	Mercer St.	330′
Warren St.....	Sussex St.....	North	240′
Logan St.....	Greenbrier St.....	"	750′
Nelson St.....	"	Norfolk St.	300′
Alley	"	Wayne St.	270′

EXHIBIT No. 58—Continued.

On—	From—	To—	Length.
Market St.	Princeton Ave.	Virginia Ave.	390'
Virginia Ave.	Market St.	Baltimore St.	180'
Franklin St.	Bowman St.	Talbot St.	120'
Bowman St.	Franklin St.	Franklin St.	150'
Franklin St.	Bowman St.	Jackson St.	180'
Alley	Calhoun St.	Jones St.	1,000'
Randolph St.	Genoa Ave.	Alley	120'
Alley	Randolph St.	Ramsey St.	90'
Tank St.	Tank	South	180'
Alley	Genoa St.	East	610'
Wilson St.	Bland St.	Genoa St.	430'
Lot No. 3.	Wilson St.	West	160'
Brown St.	Lot No. 3.	Genoa St.	310'
Ridge St.	Reservoir St.	Bland St.	1,000'
Mineral St.	Cooper St.	East	310'
Kidd St.	"	"	890'
Cooper St.	Ellis St.	Kidd St.	250'
Alley	Kidd St.	North	290'
Douglas St.	Preston St.	"	370'
Alley	Douglas St.	Bruce St.	340'
Bruce St.	Alley	North	150'
613			
Union St.	Cemetery	East	870'
Earl St.	Gilmer St.	"	980'
Lot- 17 & 16.	Earl St.	Bowyer St.	560'
Bowyer St.	Bland St.	Oakhurst Cir.	1,570'
Bland St.	Bowyer St.	South	1,240'
Adams St.	Bland St.	Vineyard St.	160'
Vineyard St.	Adams St.	South	110'
Albemarle St.	6" drain	Fulton St.	550'
Fulton St.	Albemarle St.	Olive St.	330'
Williams St.	Bland St.	Roy Ave.	620'
Stowers St.	Jefferson St.	West	430'
North St.	"	Augusta St.	1,210'
Frederick St.	Woodrow St.	Woodland St.	500'
Woodrow St.	Frederick St.	Alley	210'
View Ave.	Penn-Mar Ave.	East	670'
Augusta	10" Main	Walton Ave.	1,600'
Wythe Ave.	Albemarle St.	Rockbridge St.	380'
East River Ave.	"	Shenandoah St.	680'
Shenandoah St.	East River Ave.	East	460'
Albemarle St.	Wythe Ave.	Clinton Ave.	1,115'
Augusta St.	East River Ave.	Cemetery	520'
Walton Ave.	10" Main	South	940'
Adams St.	Golf Ave.	Baily Ave.	1,550'
Total			31,055'

1¼" Galvanized Iron Mains.

Hale St.	Walters Ave.	Adams Ave.	225'
Walters Ave.	Alley	West	340'
Alley	Between Walters	Bluefield Ave.	215'
"	" "	"	170'
"	South of Bluefield Ave.		3,450'

EXHIBIT No. 58—Continued.

On—	From—	To—	Length.
Cypress St.....	Bluefield Ave.....	Carolina Ave.	20′
Juniper St.....	"	"	20′
Tulip St.....	"	"	20′
Larch St.....	"	"	250′
Thorn St.....	"	"	160′
Magnolia St.....	"	"	20′
Balsam St.....	"	"	150′
Elm St.....	"	"	180′
Alder St.....	"	"	20′
Willow St.....	"	"	80′
Mulberry St.....	"	"	260′
Cedar St.....	"	"	20′
Lynn St.....	"	"	250′
Highland Ave.....	Maple St.....	Lynn St.	190′
Park Ave.....	Powell St.....	Powell St.	260′
Baldwin Ave.....	Pulaski St.....	Alley	260′
Alley	Baldwin Ave.....	Park Ave.	190′
614			
Nelson St.....	Norfolk St.....	North	110′
Norfolk St.....	Nelson St.	Putnam St.	340′
Talbot St.....	Franklin St.....	Princeton Ave.	320′
Raleigh St.....	Monroe St.....	Boone St.	390′
Jones St.....	Alley	East	110′
Vine St.....	Bland St.....	Alley	260′
Alley	Scott St.....	Yadkin St.	170′
McCullouch St.....	Tazewell St.....	West	140′
Alley	Genoa St.....	East	160′
East Ridge St.....	Bland St.....	"	700′
Cooper St.....	East Ridge St.....	Mineral St.	240′
Ellis St.....	Bland St.....	East	610′
Alley	Ellis St.....	Kidd St.	160′
Bland St.....	Williams St.....	Preston St.	330′
Preston St.....	10″ Main.....	East	2,000′
Eldridge St.....	Preston St.....	North	220′
Alley	Gilmer St.....	East	530′
Lakeside Ave.....	Bland St.....	"	1,010′
Spring Grove Ave...	Jefferson St.....	Alley	180′
Jefferson St.....	Spring Grove Ave..	Cumberland G. Road.....	590′
Albemarle St.....	6″ Main.....	Jefferson St.	280′
Fulton St.....	Olive St.....	South	450′
Washington St.....	Ellwood St.....	Cumberland G. Road.....	610′
Fairmont St.....	Toledo St.....	Washington St.	220′
Toledo St.....	Fairmont St.....	Ellwood St.	630′
Wythe Ave.....	Rockbridge St.....	Shenandoah St.	370′
"	Pearl St.....	Alley	220′
Alley	Wythe Ave.....	West	200′
Pearl St.....	East River Ave.....	Wythe Ave.	365′
Rockbridge St.....	" " "	East	470′
"	" " "	West	230′
Walton Ave.....	10″ Main.....	South	250′
Total			19,615′

EXHIBIT No. 58—Continued.

1" Galvanized Iron Mains.

On—	From—	To—	Length.
Bluefield Ave.	Lynn St.	Beech St.	720'
McCullouch St.	Russell St.	East	200'
Mercer St.	Randolph St.	South	100'
Cooper St.	East Ridge St.	"	120'
"	Mineral St.	Grove St.	240
Grove St.	Cooper St.	East	280'
Spring Grove Av.	Alley	Lake St.	570'
Fairmont St.	Washington St.	Toledo St.	180'
Rose St.	Fairmont St.	South	470'
Alley	4" Main	Fairmont St.	130'
Williams St.	Bland St.	Roy Ave.	50'
Roy Ave.	Williams St.	Frederick St.	80'
Penn-Mar Ave.	Frederick St.	Point St.	550'
Pearl St.	East River Ave.	West	230'
East River Ave.	Shenandoah St.	Pearl St.	400'
Walton Ave.	10" Main	North	150'
Total			4,470'

615

¾" Galvanized Iron Mains.

Beech St.	Bluefield Ave.	North	230'
Spruce St.	Highland Ave.	Carolina Ave.	150'
Cherry St.	"	"	260'
North Powell St.			280'
Alley	N. Powell St.	Park Ave.	180'
"	N. of Park Ave.		300'
"	W. " " "		370'
Baldwin Ave.	Alley	Powell St.	370'
Powell St.	Baldwin Ave.	Park Ave.	350'
"	Park Ave.	West	90'
Barge St.	Davidson St.	"	110'
Peck St.	Day St.	Lawson St.	170'
Alley	Lawson St.	North	180'
Carroll St.	Bath St.	Mercer St.	140'
Alley	Greenbrief St.	Wayne St.	380'
Vine St.	Alley	East	450'
Alley	Vine St.	Cooper St.	120'
Alley	Genoa St.	East	230'
Brown St.	Lot 3	South	40'
Ridge St.	Reservoir St.	Bland St.	680'
Alley	Earl St.	South	270'
Jefferson St.	At	Cumberland G. Road	70'
Alley	Woodrow St.	East	400'
View Ave.	Spokane Ave.	Penn-Mar Ave.	275'
Spokane Ave.	Hudson St.	View Ave.	370'
Hudson St.	Spokane Ave.	Delaware Ave.	140'
East River Ave.	Adams St.	Augusta St.	330'
Shenandoah St.	East River Ave.	West	180'
Total			7,115'

EXHIBIT No. 58—Continued.

½" Galvanized Iron Mains.

On—	From—	To—	Length.
Walnut St.	Bluefield Ave.	Highland Ave.	150′
Chestnut St.	Carolina Ave.	South	100′
Fifth Ave.	Pearis St.	East	110′
Allen St.	Lawson St.	North	130′
Alley	Allen St.	East	130′
"	"	"	160′
Beasley St.	Lawson St.	North	90′
Fairfax St.	Craig St.	McDowell St.	220′
Franklin St.	Talbot St.	East	240
Yadkin St.	Alley	Stewart St.	290′
McCullouch St.	Mercer St.	East	100′
Tyler St.	Fourth St.	Holly St.	130′
Alley	Genoa St.	North	240′
"	Preston St.	"	480′
Lewis St.	Alley	East	390′
Gilmer St.	Lewis St.	Gilmer St.	190′
Hancock St.	Jefferson St.	West	350
Frederick St.	Woodland St.	Peen-Mar Ave.	560′
Total			4,060′

616 *Total Galvanized Iron Mains.*

220	lineal feet of	2½"	mains.
2,950	" "	2"	"
31,055	" "	1½"	"
19,615	" "	1¼"	"
4,470	" "	1"	"
7,115	" "	¾"	"
4,060	" "	½"	"
69,485	" "	total Galvanized Iron Mains.	

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EXHIBIT No. 58B.

Table Showing Age of C. I. Mains.

Years laid.	Sizes. 3".	4".	6".	8".	10".	Weight.
1890-1894 incl.	10,265′	7,225′	670′	3,660′	7,830′	486.3 tons
1895-1899 "	230′	1,010′	3,340′	2,045′	.....	116.9 "
1900-1904 "	.....	6,806′	1,990′	.....	4,870′	262.3 "
1905-1909 "	.....	11,515′	8,100′	560′	8,650′	357.8 "
1910-1914 "	.....	1,780′	17,375′	5,575′	.....	441.0 "
Total	10.495′	28,336′	31,475′	11,840′	15,350′	1,664.3 "

Weighted Average Age of Cast Iron Mains, 12.0 years.

Galvanized Iron Mains assumed to be the same age.

EXHIBIT No. 59.

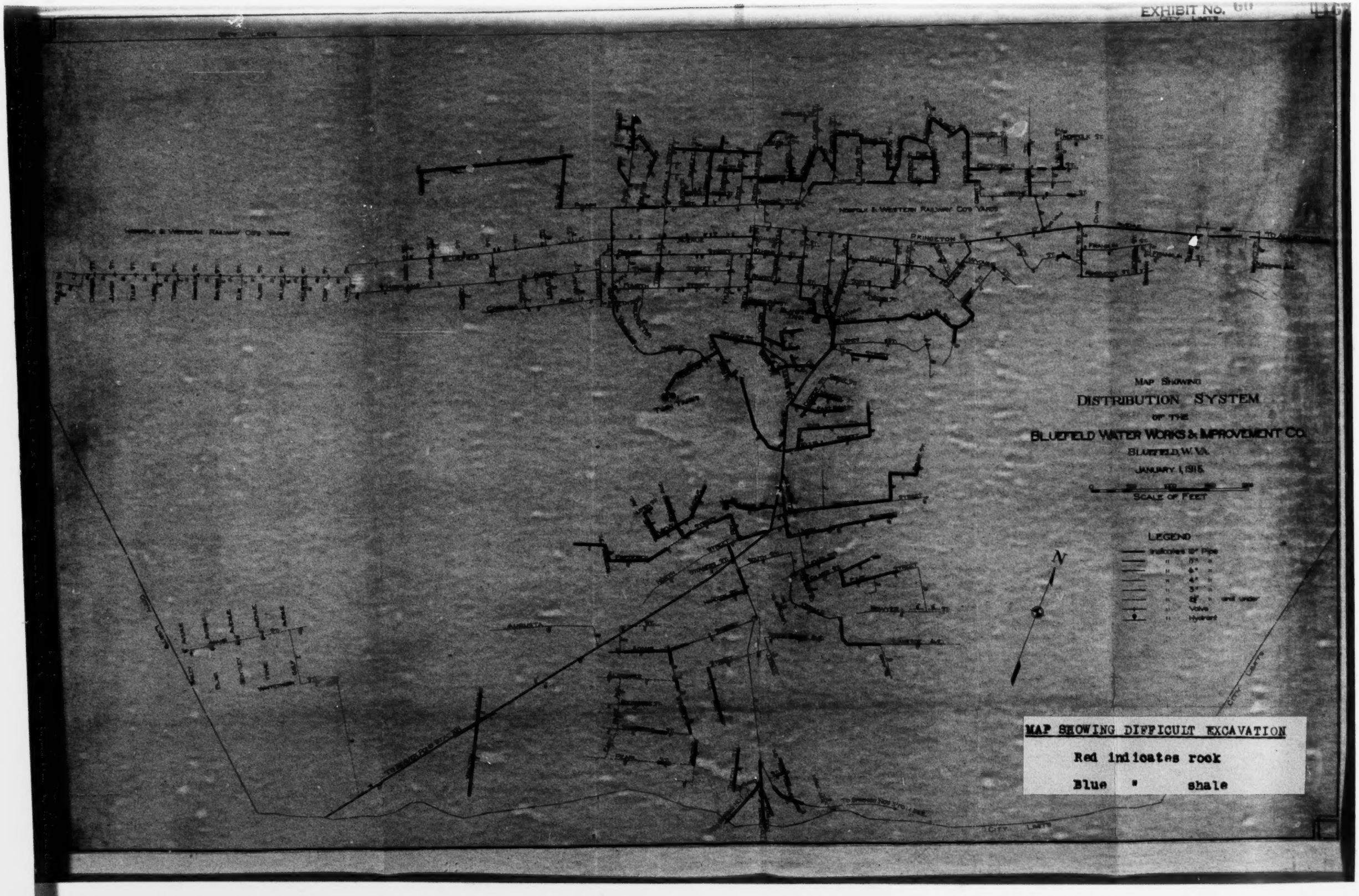
Summarized List of Specials.

No.	Kind.	Size.	Weight, per special, lbs.	Total weight, lbs.
4	Tees	10″ x 10″ x 8″	389	1,556
5	"	10″ x 10″ x 6″	371	1,855
7	"	8″ x 8″ x 8″	301	2,107
5	"	8″ x 8″ x 6″	278	1,390
5	"	8″ x 8″ x 4″	262	1,310
30	"	6″ x 6″ x 6″	203	6,090
20	"	6″ x 6″ x 4″	185	3,700
21	"	4″ x 4″ x 4″	125	2,625
8	"	4″ x 4″ x 4″	121	968
7	"	3″ x 3″ x 3″	92	644
2	Crosses	10″ x 6″	424	848
3	"	8″ x 8″	378	1,134
6	"	8″ x 6″	333	1,998
3	"	6″ x 6″	259	777
3	"	4″ x 4″	164	492
1	"Y" Branches	10″ x 10″ x 10″	434	434
1	"	8″ x 8″ x 4″	221	221
2	"	6″ x 6″ x 6″	181	362
1	"	4″ x 4″ x 4″	103	103

EXHIBIT No. 59—Continued.

No.	Kind.	Size.	Weight, per special, lbs.	Total weight, lbs.
3	¼ bends (90°)	10″	278	834
2	"	8″	200	400
17	"	6″	130	2,210
9	"	4″	82	738
5	"	3″	65	325
2	⅛ bends (45°)	10″	202	404
6	"	8″	150	900
13	"	6″	105	1,365
14	"	4″	66	924
4	"	3″	53	212
2	1/16 bends (22½°)	10″	202	404
8	"	8″	150	1,200
27	"	6″	105	2,835
10	"	4″	66	660
6	"	3″	53	318
1	Reducers	10″–8″	201	201
11	"	8″–6″	150	1,650
1	"	8″–4″	132	132
35	"	6″–4″	104	3,640
26	"	4″–3″	70	1,820

EXHIBIT No. 619



4	Plugs	8″	24	96
18	"	6″	14	252
21	"	4″	8	168
6	"	3″	5	30
30	Sleeves	10″	123	3,690
24	"	8″	104	2,496
63	"	6″	68	4,284
57	"	4″	47	2,679
21	"	3″	36	756
	Total Weight of Specials			64,237

(Here follows Exhibit No. 60, marked page 620.)

Itemized List of Difficult Excavation.

(*a*) Rock Trenches.

On—	From—	To—	Size pipe.	Length.	Depth.
Giles St.	Lee St.	Bend	4″	150′	2½
Bland St.	Hyd. Valve	Jones St.	6″	320	3
"	" "	"	10″	330	3
Higginbotham Ave.	Bland St.	Scott St.	8″	60	3
Lewis St.	Alley	East	½″	390	2
Alley	Lewis St.	Gilmer St.	4″	190	2½
Earl St.	Gilmer St.	Earl St.	4″	310	2½
Alley	Earl St.	"	1½″	270	2
Earl St.	"	"	1½″	155	2
Bland St.	Bowyer St.	South	1½″	600	2
Hancock St.	Jefferson St.	West	½″	90	2
Jefferson St.	Hancock St.	South St.	6″	280	3
"	North St.	Stowyer St.	6″	100	3
Walton Ave.	All	1½″, 1¼″ & 1″		680	2
Adams St.	East River Ave.	Jefferson St.	6″	190	3
Wythe Ave.	Adams St.	Albermarle St.	6″	40	3
Shenandoah St.	East River Ave.	Wythe Ave.	2″	150	2
Wythe Ave.	Shenandoah St.	Pearl St.	2″	410	2
Pearl St.	Wythe Ave.	East River Ave.	2″	250	2
Wythe Ave.	Pearl St.	Adams St.	1½″ & 1¼″	450	2
Fulton St.	Albemarle St.	Olive	1½″ & 1¼″	265	2
Toledo St.	Elwood St.	Fairmont St.	1¼″	160	2

Fairmont St.	Washington St.	Rose St.	1¼″	30	2
Washington St.	Turnpike	Elwood St.	1¼″	305	2
Spring Grove Ave.			1″	100	2
Rose St.	Turnpike to	Fairmont St.	1″	470	2
Wayne St.	In Lincoln St.		4″	30	3
Logan St.	Wayne St.	Greenbrier St.	4″	360	2½
"	At York St.		1½″	75	2½
Orange St.	Warren St.	Hardy St.	6″	20	3
Alley	Park St.	S. Powell St.	¾″	370	1½
N. Powell St.	Exetor St.	Powell St.	¾″	180	1½
Powell St.	N. Powell St.	Park St.	¾″	180	1½
Park St.	Powell St.	S. Powell St.	1¼″	260	1½
S. Powell St.	N. Powell St.	Park St.	¾″	90	1½

1,080 lineal feet of trench 1½ ft. deep.
4,775 " " " " 2 " "
985 " " " " 2½ " "
1,370 " " " " 3 " "

8,210 Total lineal feet of Rock Excavation.

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(*b*) Shale Trenches.

Boone St.	Wyoming St.	Lot #13	4″	100′	3′
Lot #13	Boone St.	Charleston Ter.	4″	180	3
High St.	Higginbotham Ave.	Calhoun St.	4″	840	3
Calhoun St.	High St.	Charleston Ter.	4″	1,110	3
Jones St.	Calhoun St.	Jones St.	1½″	130	2
Genoa St.	Randolph St.	Belcher St.	8″	510	3
Randolph St.	Mercer St.	Genoa St.	8″	250	3

EXHIBIT No. 61—Continued.

On—	From—	To—	Size pipe.	Length.	Depth.
Tank Lot	Russell St.	Bland St. Tank	8"	360	3
Tank St.	Bland St.	West	½"	160	2
Vine St.	"	East	1¼"	120	2
"	"	"	¾"	275	2
Brown St.	Ridge St.	Wilson St.	¾"	40	2
"	Lot No. 3	Genoa St.	1½"	310	2
Lot No. 3	Wilson St.	Brown St.	1½"	160	2
Genoa St.	"	Bland St.	10"	370	3
Alleys	Genoa St.	North	½"	150	2
"	"	East	1½"	180	2
"	"	"	1¼"	290	2
"	"	"	1½"	290	2
"	"	"	¾"	230	2
Belcher St.	"	Ridge St.	10"	670	3
Ridge St.	Belcher St.	Reservoir St.	10"	230	3
Ridge St. & Alley	Ridge St.	Bland St.	¾"	680	2
" " " "	"	"	1½"	1,000	2
Ridge St.	Reservoir St.	East	¾"	90	2
Reservoir St.	Ridge St.	Twin Tanks	10"	920	3
East Ridge St.	Bland St.	"E" St.	1¼"	700	2
Cooper St.	East Ridge St.	Mineral St.	1¼"	240	2
Mineral St.	Cooper St.	East	1½"	330	2
Cooper St.	East Ridge St.	South	1"	120	2
Kidd St.	All		1½"	890	2
Ellis St.	Bland St.	East	4"	180	2½
"	"	"	6"	300	3

Cooper St.	Ellis St.	North	1½"	250	2
Union St.	Bland St.	East	6"	620	3
"	Cemetery	"	1½"	870	2
North St.	Bland St.	Roy St.	6"	430	2½
Bland St.	Preston St.	Union St.	6"	310	2½
Elbridge	"	North	1¼"	160	2
Roy St.	Frederick St.	Williams St.	6"	320	2
Williams St.	Roy St.	Bland St.	1"	140	2
"	"	"	1½"	620	2
Roy St.	Frederick St.	Williams St.	1"	80	2
Frederick St.	Roy St.	Penn-Mar St.	6"	550	3
Hudson St.	Spokane St.	Delaware St.	¾"	140	2
Penn-Mar St.	Point St.	Frederick	1"	550	2
View Ave.	Spokane St.	Penn-Mar St.	¾"	275	2
"	Pen-Mar St.	Alley North	1½"	670	2
Spokane St.	View St.	Hudson St.	¾"	370	2
Frederick St.	Penn-Mar St.	Woodland St.	1½"	500	2
"	Woodland	Woodrow St.	½"	400	2
Woodrow St.	Frederick	Alley North	1½"	210	2

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Alley	Woodrow St.	400' West	¾"	400'	2'
*Adams St.	East River Ave.	Jefferson St.	6"	1,830	3
Bruce St.	Indian St.	Douglas St.	1½"	150	2
Indian St.	Douglas St.	Bruce St.	1½"	340	2
Payne St.	"	Preston St.	1½"	370	2

*Water was encountered for the full length of this pipe in such quantities that continual pumping was necessary. No braces were required however.

EXHIBIT No. 61—Continued.

On—	From—	To—	Size pipe.	Length.	Depth.
Preston St.	Payne St.	Bland St.	1¼"	1,365	2
Elbridge St.	Preston St.	North	1¼	90	2
Alley	Kidd St.	"	1½"	160	2
"	"	Ellis St.	1¼"	160	2
Greenbrier St.	Logan St.	Nelson St.	4"	90	2½
"	Nelson St.	Lincoln St.	4"	100	2½
Nelson St.	Greenbrier St.	Norfolk St.	1½"	200	2
Greenbrier St.	York St.	Henry St.	4"	340	2½
Hardy St.	Henry St.	Grant St.	3"	145	2½
Henry St.	Greenbrier St.	Hanover St.	6"	400	3
Sussex St.	Warren Ave.	"	6"	590	3
Warren Ave.	Sussex St.	Orange St.	6"	300	3
Surry St.	Orange St.	Page St.	4"	100	2½
Page St.	Surry St.	Patrick St.	3"	160	22½
Surry St.	Page St.	Hardy St.	4"	320	2½
Hardy St.	Surry St.	Patrick St.	4"	250	2½
"	Patrick St.	Orange St.	4"	140	2½
Orange St.	Warren St.	Halifax St.	6"	720	3
"	Halifax St.	Hardy St.	3"	190	2½
Halifax St.	Orange St.	Turn	6"	100	8
In Lot	R. R. Track	Hardy	4"	60	2½
Hardy St.	West End	Fairfax St.	4"	235	2½
"	Floyd St.	Orange St.	4"	270	2½
Halifax St.	Turn	King St.	6"	350	3
King St.	Halifax St.	Floyd St.	6"	330	3
Floyd St.	King St.	Craig St.	6"	100	3

Craig St.	Floyd St.	Fairfax St.	6"	350	3
Fairfax St.	Craig St.	Roanoke St.	6"	320	3
Roanoke St.	Fairfax St.	Clarke St.	6"	340	3
"	Clarke St.	Bedford St.	6"	450	3½
"	"	"	3"	480	3½
Bedford	Roanoke	Carrol St.	6"	160	3½
"	"	"	3"	170	3½
Carroll St.	Bath St.	Bedford St.	6"	190	3
"	"	"	3"	215	3
Bedford St.	Carrol St.	Mercer St.	6"	200	3
"	"	"	3"	200	3
Mercer St.	Lawson St.	Bedford St.	3"	130	3
"	Bath St.	Carrol St.	4"	330	3
Bedford St.	Mercer St.	Peck St.	3"	210	3
Day St.	Peck St.	Davidson St.	3"	180	3
Peck St.	Day St.	Lawson St.	¾"	170	1½
Lawson St.	Mercer St.	Allen St.	4"	1,145	3
Melcher St.	Lawson St.	North	¾"	180	2
Reese St.	"	Pulaski St.	4"	710	1½
Pulaski St.	Allen St.	Baldwin St.	8"	100	3

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Baldwin	Alley	Powell St.	¾"	100'	2'
Powell St.	Baldwin St.	Park St.	¾"	350	2
"J" St.	"K" St.	Powell St.	¾"	170	2
"K" St.	"J" St.	Lot No. 3	¾"	130	2
Rock St.	Hill St.	Pulaski St.	1½"	630	2
Hill St.	100' E. of Rock St.	Couch St.	1½"	1,930	2
Couch St.	Hill St.	South	1½"	270	2

EXHIBIT No. 61—Continued.

Total.

880	Lineal	feet	of	trench	1½	feet	deep.
18,935	"	"	"	"	2	"	"
3,320	"	"	"	"	2½	"	"
15,540	"	"	"	"	3	"	"
1,260	"	"	"	"	3½	"	"
100	"	"	"	"	8	"	"
40,035	Total	Lineal	feet	of	Shale	Excavation.	

(Here follows Exhibit No. 62, marked page 625.)

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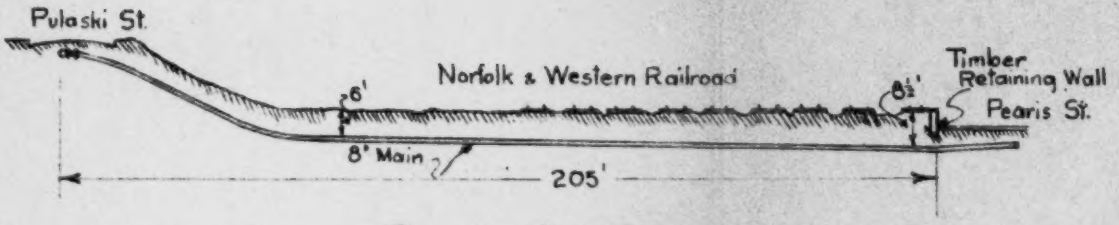
[Illustration omitted.]

EXHIBIT No. 63.

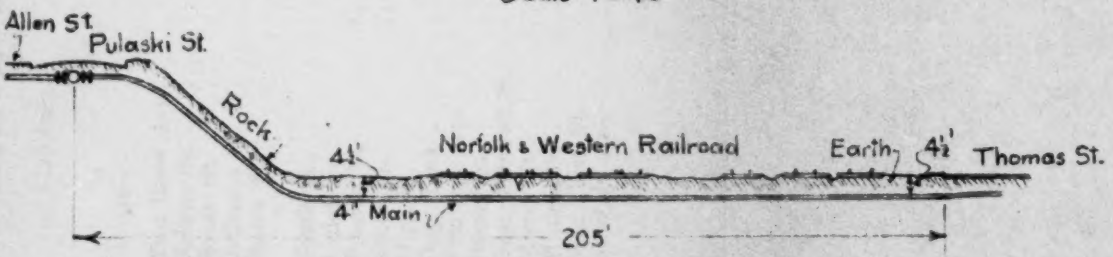
Railroad Crossing at Mercer Street, Showing Retaining Walls.

Exhibit No. 62

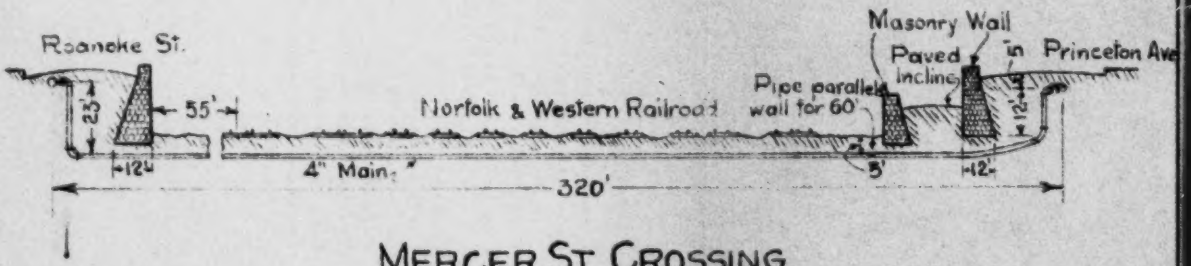
SKETCH SHOWING
STEAM RAILROAD CROSSINGS



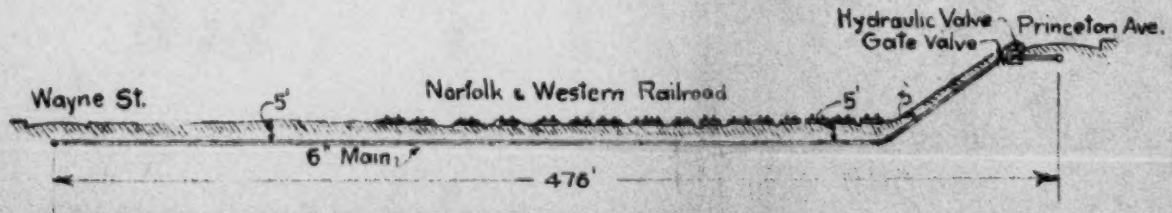
PEARIS ST. CROSSING
Scale 1"= 40'



THOMAS ST. CROSSING
Scale 1"= 40'



MERCER ST. CROSSING
Scale 1"= 50'



LOGAN ST. CROSSING
Scale 1"= 80'

EXHIBIT No. 64.

Itemized List of Street Railway Crossings.

(*a*) Cast Iron.

Right Angle Crossings:

On—	At—	Tracks crossed.
Adams Street	East River Ave.	1
Jefferson St.	Adams St.	1
"	South St.	1
North St.	Jefferson St.	1
Roy St.	North St.	1
Bland St.	"	1
"	South St.	1
"	Union St.	1
"	Preston St.	1
"	Jones St.	1
"	High St.	1
"	Opp. Tank	1
"	Princeton Ave.	1
Princeton Ave.	Russell St.	1
"	Near Tazewell St.	1
"	Mercer St.	1
"	Munroe St.	1
"	Near Giles St.	1
Mercer St.	Bluefield Ave.	1

EXHIBIT No. 64.—Continued.

On—	At—	Tracks crossed.
Bluefield Ave.	Near Mercer St.	1
"	Thomas St.	1
"	Pearis St.	1
"	Poplar St.	1
"	Beech St.	1
Total		24

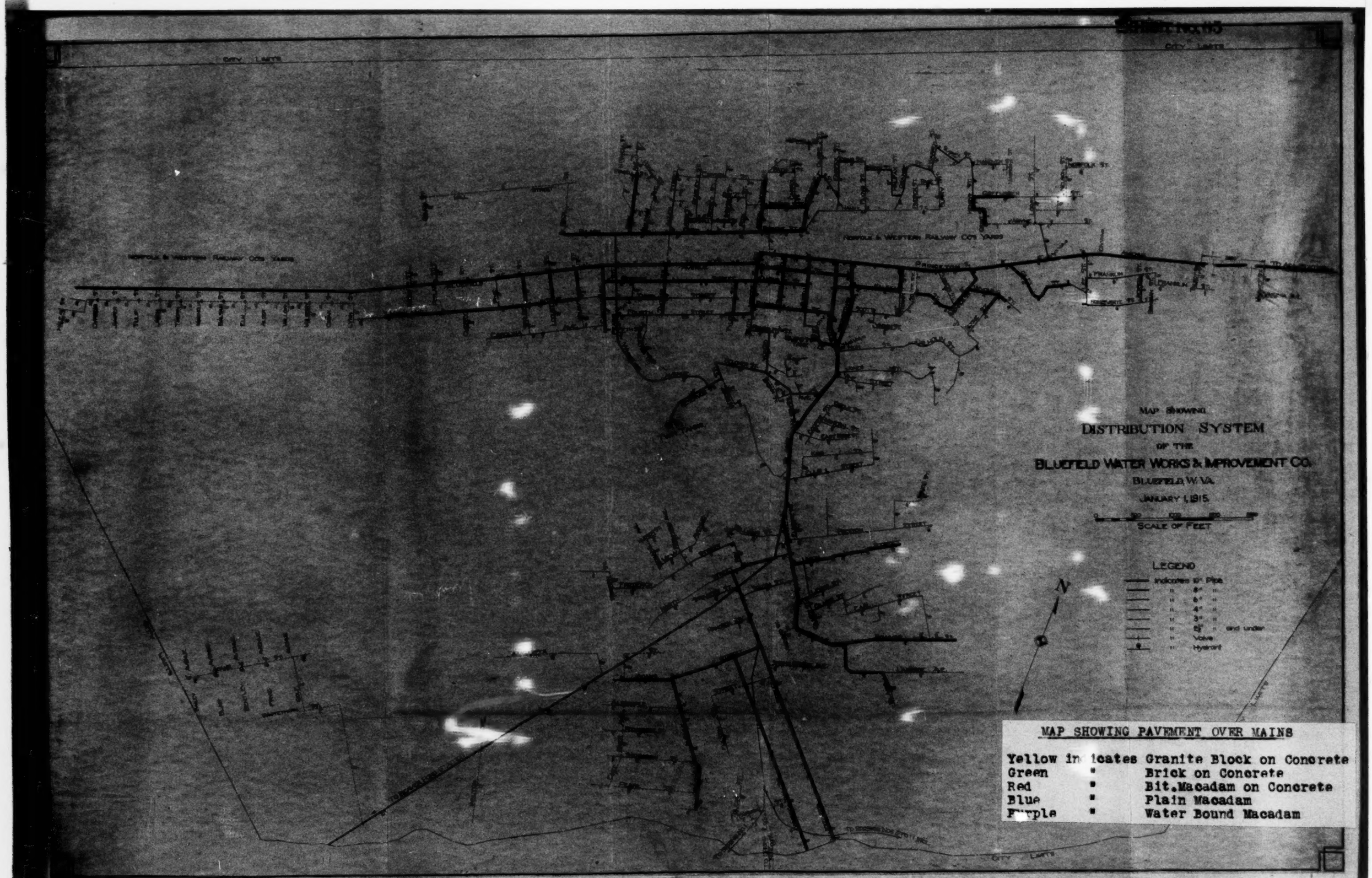
Diagonal Crossings:

On—		Tracks crossed.	Length.
Jefferson St.	Stowers St.	1	9′
North St.	Near Bland St.	1	9
Bland St.	Williams St.	1	18
"	Wilson St.	1	25
Total		4	61′

(*b*) Galvanized Iron.

Right Angle Crossings:

On—	At—	Tracks crossed.
Bland St.	Preston St.	1
"	Vine St.	1


CITY LIMITS
NORFOLK & WESTERN RAILWAY CO'S YARDS
MAP SHOWING
DISTRIBUTION SYSTEM
OF THE
BLUEFIELD WATER WORKS & IMPROVEMENT CO.
BLUEFIELD W. VA.
JANUARY 1, 1915.
SCALE OF FEET
LEGEND
Indicates 10" Pipe
" 8" "
" 6" "
" 4" "
" 3" "
" 2" " and under
" Valve
" Hydrant
N
MAP SHOWING PAVEMENT OVER MAINS
Yellow indicates Granite Block on Concrete
Green " Brick on Concrete
Red " Bit.Macadam on Concrete
Blue " Plain Macadam
Purple " Water Bound Macadam

Bluefield Ave.	Walnut St.	1
"	Locust St.	1
Total		4

Diagonal Crossings:

On—		Tracks crossed.	Length.
Bland St.	Ridge St.	1	14′
"	Wilson St.	1	12
Total		2	26′

(Here follows Exhibit No. 65, marked page 628.)

Itemized List of Mains under Street Paving.

(a) Brick on Concrete.

Cast Iron Mains:

On—	From—	To—	Size.	Length.
Bluefield Ave	W. S. Poplar St	C. Thomas St.	6″	2,970′
"	C. Thomas St.	C. Mercer St.	8	1,160
Poplar St	S. S. Bluefield Ave	N. S. Bluefield Ave.	6	50
Pine St	"	"	4	50
Pearis St	"	"	8	50
Thomas St	N. S. "	Railroad	4	180
"	S. S. "	N. S. Bluefield Ave.	6	50
Bluefield Ave	Center	N. Curb	6	25
Mercer St	S. S. Bluefield Ave	Bridge	4	140
"	"	"	8	110
Princeton Ave	C. Mercer St	C. Bland St.	4	1,005
"	C. Street	N. Curb	4	25
Russell St	C. Princeton Ave	N. S. Princeton Ave.	4	25
Princeton Ave	C. Bland St.	C. Stewart St.	6	830
"	C. Stewart St.	C. Monroe St.	4	870
Monroe St	C. Princeton Ave	N. Curb	3	25
Princeton Ave	C. Monroe St.	260′ E. of Giles Ave	8	750
"	260′ E. of Giles Ave	E. S. Lee St.	10	760
"	C. Princeton Ave	N. S. Curb	6	25
Tazewell St	"	S. S. Princeton Ave.	6	25
Russell St	"	"	6	25
Scott St	"	"	3	25

Summers St.	"	"	3	25	
Monroe St.	"	"	8	25	
Giles St.	"	"	4	25	
Lee St.	"	"	6	25	
Stewart St.	"	S. S. Raleigh St.	6	340	
Raleigh St.	E. S. Stewart St.	C. Higginbotham Ave.	8	635	
Bland St.	C. Princeton Ave.	C. Ramsey St.	6	670	
"	C. Ramsey St.	W. S. at Williams St.	10	2,800	
"	Tank Line	C. Genoa St.	6	710	
"	" "	C. High St. & Bland	6	70	
Higginbotham Av.	C. Princeton Ave.	C. Bland St.	8	1,080	
"	Center	E. Curb	6	25	
Scott St.	C. Higginbotham Ave.	E. S. Higginbotham Av.	3	25	
Bland St.	"	W. S. Bland	10	70	
Jones St.	E. S. Bland St.	W. S. "	4	50	
Genoa St.	C. "	W. S. "	10	25	
Ellis St.	" "	E. S. "	4	25	
Bland St.	S. S. Preston St.	C. Union St.	6	300	
North St.	C. Bland St.	W. S. Bland St.	6	25	
Union St.	"	E. S. "	6	25	
Bland St.	C. South St.	End of Brick	4	180	
South St.	C. Bland St.	W. S. Bland St.	4	25	
Roanoke St.	W. S. Mercer St.	E. S. Roanoke	6	600	
"	Center	S. Curb	4	20	
"	"	"	4	25	
"	"	E. S. Clarke St.	3	780	
"	Bedford St.	"	6	470	
630					
Clarke St.	C. Roanoke St.	W. S. Roanoke	3"	25'	

EXHIBIT No. 66—Continued.

On—	From—	To—	Size.	Length.
Bedford St.	"	E. S. Mercer St.	3	550
"	"	"	6	560
Carrol St.	C. Bedford St.	W. S. Bedford St.	3	20
"	"	"	6	25
Henry St.	C. Greenbrier St.	W. S. Greenbrier St.	6	20
Henry St.	"	C. Hardy St.	3	150
Greenbrier St.	C. Henry St.	E. S. Henry St.	4	20
Hardy St.	C. "	C. Grant St.	3	145
Grant St.	C. Hardy St.	C. Wayne St.	3	180
Wayne St.	C. Grant St.	E. S. Grant St.	3	20
Total				19,965′

Galvanized Iron Mains:

Locust St.	C. Bluefield Ave.	N. S. Bluefield Ave.	1½	25
Walnut St.	C. "	" "	2	25
Jones St.	C. Bland St.	E. S. Bland St.	1¼	25
East Ridge St.	" "	" "	1¼	25
Ridge St.	" "	W. S. "	1½	25
Bland St.	S. S. Preston St.	Williams St.	1¼	360
Preston St.	E. S. Bland St.	W. S. Bland St.	1¼	50
McCullouch St.	C. Russell St.	East	1	200
"	E. S. Mercer St.	"	½	100
Total				835′

(*b*) Granite Block on Concrete.

Cast Iron Mains:

Scott St.	S. S. Princeton Ave.	S. S. Raleigh St.	3	220
"	"	"	6	90
"	Center	W. Curb	6	20
Raleigh St.	E. S. Scott St.	E. S. Stewart St.	8	190
Total				520′

(*c*) Plain Macadam.

Cast Iron Mains:

Bluefield Ave.	W. S. Poplar St.	W. of Beech St.	6	380
Beech St.	C. Bluefield Ave.	N. S. Bluefield Ave.	6	25
Adams St.	C. East River Ave.	C. Jefferson St.	6	1,840
East River Ave.	S. S. Adams St.	W. S. Adams St.	6	40
Wythe Ave.	C. "	S. S. "	6	32
Adams St.	W. of Jefferson St.	Curb	6	23
Jefferson St.	C. Adams St.	C. North St.	6	1,010
Smith St.	C. Jefferson St.	E. S. Jefferson St.	4	20
Beaver Pond Main	W. S. "	"	10	75

631

North St.	W. S. Jefferson St.	W. S. Bland St.	6″	785′
Roy St.	C. North St.	" North St.	6	20
Beaver Pond Line	S. S. North St.	"	10	80
Raleigh St.	E. S. Scott St.	C. Monroe St.	8	500

EXHIBIT No. 66—Continued.

On—	From—	To—	Size.	Length.
Monroe St.	Center	C. Princeton Ave.	8	620
Wyoming St.	C. Monroe St.	E. S. Boone St.	4	460
Giles St.	C. Princeton Ave.	Bend near Lee St.	4	1,030
Total				6,940′
Galvanized Iron Mains:				
Bluefield Ave.	W. of Beech St.	W. S. Lynn St.	1	720
Hancock St.	" Jefferson St.	W. S. Jefferson St.	½	20
Stowers St.	"	"	1½	20
Bowyer St.	N. S. Street	S. S. Street	1½	40
Bland St.	At Lakeside Ave		1½	60
Monroe St.	C. Monroe St.	E. S. Street	1¼	65
Total				925′
(*d*) Bitulithic Macadam on Concrete.				
Highland Ave.	E. S. Maple St.	E. S. Walnut St.	4	2,485
Pine St.	C. Highland Ave.	N. S. Highland Ave.	4	25
Spruce St.	S. S. "	"	4	50
Highland Ave.	C. Chestnut St.	West	4	70
Chestnut St.	C. Rogers St.	C. Carolina Ave.	4	560
Rogers St.	C. Chestnut St.	C. Pearis St.	4	180
"	C. Pearis St.	C. Mercer St.	6	1,790

Third St	C. Chestnut St	E. S. Thomas St	4	780	
Fourth St	W. S. Tyler St	C. Tyler St	4	25	
"	C. "	C. Mercer	6	240	
Pearis St	W. S. Rogers St	S. S. Rogers St	8	50	
"	N. S. Third St	S. S. Third St	8	50	
Thomas St	S. S. Bluefield Ave	C. Rogers St	4	180	
"	C. Rogers St	N. S. Fourth St	6	400	
Tyler St	"	C. Fourth St	6	415	
Mercer St	S. S. Bluefield Ave	C. Duhring St	8	170	
"	C. Duhring St	C. Fourth St	6	425	
"	C. Fourth St	S. S. "	8	25	
Duhring St	C. Mercer St	C. Russell St	8	675	
Ramsey St	"	"	6	690	
"	C. Russell St	C. Bland St	8	350	
Tazewell St	S. S. Bluefield Ave	C. Duhring St	6	315	
"	C. Duhring St	C. Ramsey St	3	340	
Russell St	S. S. Bluefield Ave	C. Duhring St	6	300	
"	C. Duhring St	S. S. Ramsey St	8	350	
Boone St	W. S. Wyoming St	West	4	300	
Greenbrier St	E. S. Henry St	W. S. York St	4	540	
Mercer St	N. S. Roanoke St	C. Bedford St	6	280	
"	C. Bedford St	S. S. Lawson St	3	350	
Bedford St	C. Mercer St	E. S. Mercer St	3	20	
"	"	"	6	20	
"	"	W. S. "	3	20	

632

Park Ave	N. S. Pulaski St	Alley	4"	290'	

EXHIBIT No. 66—Continued.

On—	From—	To—	Size.	Length.
Park Ave	Alley	S. S. Powell St	6	450
Union St	E. S. Bland St	E. S. Cemetery	6	555
Forrest St	E. S. Union St	W. S. Union St	6	45
Spring Main	E. S. Jefferson St	W. S. Jefferson St	6	45
"	" Washington St	" Washington Ave	6	180
"	"	"	6	100
Albemarle St	W. Curb Wythe Ave	E. S. Wythe Ave	6	30
"	"	W. S. "	6	10
Wythe Ave	S. S. Albemarle St	N. S. Albermarle St	6	40
Total				14,215'
Galvanized Iron Mains:				
Cherry St	C. Highland Ave	S. S. Highland Ave	¾	25
Locust St	"	"	1½	25
Walnut St	"	North	½	150
Chestnut St	C. Carolina Ave	S. S. Carolina Ave	½	25
Alley	C. Rogers St	S. S. Rogers St	1½	25
"	C. Third St	N. S. Third St	1½	25
Tyler St	C. Fourth St	S. S. Fourth St	½	25
McCullouch St	C. Tazewell St	West	1¼	140
"	C. Russell St	E. S. Russell St	1	25
Alley	C. Park Ave	W. S. Park Ave	¾	25
Albemarle St	E. Curb Jefferson	W. S. Jefferson St	1¼	30

Spring Grove Ave.	" "	E. S. "	1¼	10
Albemarle St.	E. S. Washington St.	W. S. Washington St.	1½	40
Fairmont St.	W. S. Washington St.	E. Curb "	1¼	30
Shenandoah St.	W. Curb Wythe Ave.	W. S. Wythe Ave.	2	10
Pearl St.	"	"	2	10
Alley	"	"	1¼	10
Wythe Ave.	S. S. Rockbridge St.	N. S. Rockbridge St.	1½	40
"	S. S. Shenondoah St.	C. Shenandoah St.	2	20
"	N. S. "	"	1¼	20
Total				710′

(*e*) Water Bound Macadam.

Cast Iron Mains:

Pulaski St.	W. S. Mercer St.	C. Allen St.	6	1,145
"	C. Allen St.	C. Pearis St.	8	680
"	C. Pearis St.	W. S. Rock St.	4	680
Peck St.	C. Pulaski St.	N. S. Pulaski St.	3	10
"	" "	S. S. "	6	20
Barger St.	" "	N. S. "	4	10
Reese St.	" "	" "	4	10
Burton St.	" "	" "	4	10

633

Allen St.	C. Pulaski St.	N. S. Pulaski St.	6″	15′
"	" "	S. S. "	4	15
Baldwin Ave.	" "	N. S. "	4	15

EXHIBIT No. 66—Continued.

On—	From—	To—	Size.	Length.
Park Ave	" "	" "	4	15
Pearis St	" "	S. S. "	8	15
Princeton Ave	E. S. Lee St	S. S. Princeton Ave	10	180
"	S. S. Street	N. S. Street	10	800
Lewis St	E. S. Bland St	W. Curb Bland St	6	30
Bland St	N. S. Lewis St	S. S. Lewis St	4	40
"	N. S. Adams St	S. S. Adams St	6	40
Total				3,730′

Galvanized Iron Mains:

Rock St	C. Pulaski St	N. S. Pulaski St	1½	15
Adams St	West Curb Bland St	W. S. Bland St	1¼	10
Total				25′

(*f*) Mains in Parkings.

Cast Iron Mains:

Bland St	S. S. Preston St	C. Union St	6	310
"	C. Lewis St	W. S. at Bowyer St	6	1,040
Wythe Ave	S. S. Adams St	S. S. Albermarles St	6	430
Total				1,780′

Galvanized Iron Mains:

Bland St.	N. S. Preston St.	S. S. Williams St.	1¼	330
Union St.	Cemetery	East	1½	830
Bland St.	Bowyer St.	South	1½	1,210
Bowyer St.	Bland St.	Oakhurst Cir.	1½	1,570
Jefferson St.	C. Spring Grove Ave.	N. S. Bay St.	1¼	500
Wythe Ave.	S. S. Albemarle St.	S. S. Rockbridge St.	1½	360
"	S. S. Rockbridge St.	C. Shenandoah St.	1¼	370
Washington St.	At Turnpike		1¼	610
Total				5,780′

Itemized List of Valves on Mains, Showing Location and Size.

On—	At—	Size.	Number valves.	Number boxes.
North St.	Beaver Pond Line	10″	1	1
Higginbotham Ave	Bland St.	10	1	1
Bland St.	Ramsey St.	10	1	1
"	Genoa St.	10	3	3
Total		..	6	6
Higginbotham Ave	Bland St.	8″	1	1
Pearis St.	Pulaski St.	8	1	1
Pulaski St.	Baldwin Ave.	8	1	1
"	Allen St.	8	1	1
Bluefield Ave.	Pearis	8	1	1
Pearis St.	Bluefield Ave.	8	2	2
"	Rogers St.	8	2	2
"	Fourth St.	8	1	1
Bluefield Ave.	Mercer St.	8	2	2
Princeton Ave.	Monroe St.	8	1	1
Mercer St.	Fourth St.	8	1	1
Duhring St.	Tazewell St.	8	1	1
Russell St.	Duhring St.	8	1	1
Russell St.	Ramsey St.	8	2	2
Bland St. Line	Alley	8	Check V.	..
Ramsey St.	Bland St.	8	1	1

Genoa St.	Belcher St.	8	1	1
Higginbotham Ave.	Princeton Ave.	8	1	1
"	Raleigh St.	8	1	1
Raleigh St.	Higginbotham Ave.	8	1	1
Total G. V.			23	23
" C. V.			1	..
Scott St.	Raleigh St.	6"	1	1
"	Near "	6	1	1
Stewart St.	"	6	1	1
R. R. Crossing	Near Giles	6	1	1
Franklin St.	Lee St.	6	1	1
Ronceverte St.	"	6	1	1
Jackson St.	Ronceverte St.	6	1	1
Higginbotham Ave.	Near Raleigh St.	6	1	1
Princeton Ave.	Stewart St.	6	1	1
Stewart St.	Princeton Ave.	6	1	1
Halifax St.	Orange St.	6	1	1
Tazewell St.	Princeton St.	6	1	1
Russell St.	"	6	1	1
Bland St.	"	6	1	1
Princeton Ave.	Bland St.	6	1	1
Princeton Ave.	Higginbotham Ave.	6	2	2
Roanoke St.	Pulaski St.	6	2	2
"	Clarke St.	6	1	..
635				
Stewart St.	Scott St.	6"	1	1
Higginbotham Ave.	Bland St.	6	2	2

EXHIBIT No. 67—Continued.

On—	At—	Size.	Number valves.	Number boxes.
Bland St.	Genoa St.	6	1	1
Bluefield Ave.	W. of Walnut St.	6	1	1
Allen St.	Pulaski St.	6	1	1
Pulaski St.	Allen St.	6	1	1
Thomas St.	Bluefield Ave.	6	1	1
Rogers St.	Pearis St.	6	1	1
"	Thomas St.	6	2	2
Fourth St.	Pearis St.	6	1	1
"	Thomas St.	6	1	1
Thomas St.	Fourth St.	6	1	1
Bluefield Ave.	W. of Mercer St.	6	1	1
Princeton Ave.	Lee St.	6	1	..
Lee St.	Princeton Ave.	6	1	1
Princeton Ave.	E. of Lee St.	6	1 Check V.	..
Talbot St.	Princeton Ave.	6	1	1
Franklin St.	Jackson St.	6	1	1
Floyd St.	King St.	6	1	1
Henry St.	Greenbrier St.	6	1	1
Orange St.	Surry St.	6	1	1
Wayne St.	Logan St.	6	1	..
Bedford St.	Mercer St.	6	1	1
"	Carroll St.	6	2	2
Pulaski St.	Mercer St.	6	1	1
"	Peck St.	6	1	1
Fairfax St.	Roanoke St.	6	1	1
Rogers St.	Tyler St.	6	1	1

Tyler St.	Rogers St.	6	1	1
Rogers St.	Mercer St.	6	1	1
Mercer St.	Rogers St.	6	1	1
Fourth St.	Tyler St.	6	1	1
Tyler St.	Fourth St.	6	1	1
Ramsey St.	Mercer St.	6	1	1
Mercer St.	Fourth St.	6	1	1
Tazewell St.	Duhring St.	6	1	1
Ramsey St.	Tazewell St.	6	1	1
"	Russell St.	6	1	1
Bland St.	Ramsey St.	6	1	1
Bluefield Ave.	Poplar St.	6	1	1
Poplar St.	Bluefield Ave.	6	1	1
Beech St.	"	6	1	1
Adams St.	East River Ave.	6	1	1
East River Ave.	Adams St.	6	2	2
Wythe Ave.	"	6	1	1
Albemarle St.	Wythe Ave.	6	2	2
Adams St.	Near Jefferson St.	6	2	2
North St.	Roy St.	6	1	1
Roy St.	North St.	6	1	1
Jefferson St.	"	6	1	1
"	Stower St.	6	2	2
Bland St.	"	6	1	1
North St.	Bland St.	6	1	1
"	Beaver Pond Line	6	2	2
Lewis St.	Bland St.	6	1	1
Total G. V.			82	79
" C. V.			1	..

On—	At—	Size.	Number valves.	Number boxes.
Hardy St.	R. R.	4"	1	1
Roanoke St.	Pulaski St.	4	3	2
Princeton Ave.	Bland St.	4	1	1
"	Russell St.	4	1	1
Russell St.	Princeton Ave.	4	1	1
Princeton Ave.	Tazewell St.	4	2	2
"	Stewart St.	4	1	1
Giles St.	Lee St.	4	1	1
Lawson St.	Allen St.	4	1	1
"	Reese St.	4	1	1
Reese St.	Pulaski St.	4	1	1
Higginbotham Ave.	Bland St.	4	2	2
Jones St.	"	4	2	2
Pulaski St.	Rock St.	4	1	1
Park St.	Pulaski St.	4	1	1
Baldwin Ave.	"	4	1	1
Allen St.	"	4	1	1
Burton St.	"	4	1	1
Thomas St.	Bluefield Ave.	4	1	1
Rogers St.	Pearis St.	4	1	1
Thomas St.	Rogers St.	4	1	1
Chestnut St.	Third St.	4	2	2
Third St.	Pearis St.	4	2	2
"	Thomas St.	4	1	1
Bluefield Ave.	W. of Mercer St.	4	1	..
Greenbrier St.	Lincoln St.	4	1	1
"	Henry St.			

Orange St.	Surry St.	4	1	1
Wayne St.	Logan St.	4	2	2
Logan St.	Wayne St.	4	1	1
Bath St.	E. of Carroll St.	4	1	1
Mercer St.	Bath St.	4	1	1
Lawson St.	Mercer St.	4	1	1
Bedford St.	"	4	1	1
Mercer St.	Bedford St.	4	1	1
"	Pulaski St.	4	1	1
R. R. Crossing	Roanoke St.	4	1	1
Barger St.	Pulaski St.	4	1	1
Princeton Ave.	Monroe St.	4	1	1
Giles St.	Princeton Ave.	4	1	1
Wyoming St.	Monroe St.	4	1	1
Boone St.	Wyoming St.	4	1	1
Mercer St.	Bluefield Ave.	4	1	1
Third St.	Tyler St.	4	1	1
Tazewell St.	Ramsey St.	4	1	1
Highland Ave.	Maple St.	4	1	1
Maple St.	Highland Ave.	4	1	1
Highland Ave.	Pine St.	4	1	1
Pine St.	Highland Ave.	4	1	1
Ellis St.	Bland St.	4	1	1
South St.	Jefferson St.	4	1	1
Alley	Union St.	4	1	1
"	Lewis St.	4	1	1
Lewis St.	Bland St.	4	1	1
Earl St.	Earl St.	4	1	1
Total			63	61

EXHIBIT No. 67—Continued.

On—	At—	Size.	Number valves.	Number boxes.
Fairfax St.	Hardy St.	3″	1	1
Floyd St.	"	3	2	1
Roanoke St.	Clarke St.	3	1	1
Clarke St.	Roanoke St.	3	1	1
Roanoke St.	Pulaski St.	3	1	1
Orange St.	Hardy St.	3	1	1
Summers St.	Princeton St.	3	1	1
Scott St.	"	3	1	1
"	W. of Stewart St.	3	1	1
"	Stewart St.	3	1	1
Henry St.	Greenbrier St.	3	1	1
Mercer St.	Lawson St.	3	1	1
Bedford St.	Peck St.	3	1	1
Davidson St.	Day St.	3	1	1
Monroe St.	Princeton St.	3	1	1
Tazewell St.	Duhring St.	3	1	1
Carolina St.	Spruce St.	3	1	1
Floyd St.	King St.	3	1	1
Hanover St.	Henry St.	3	1	1
Total			20	19

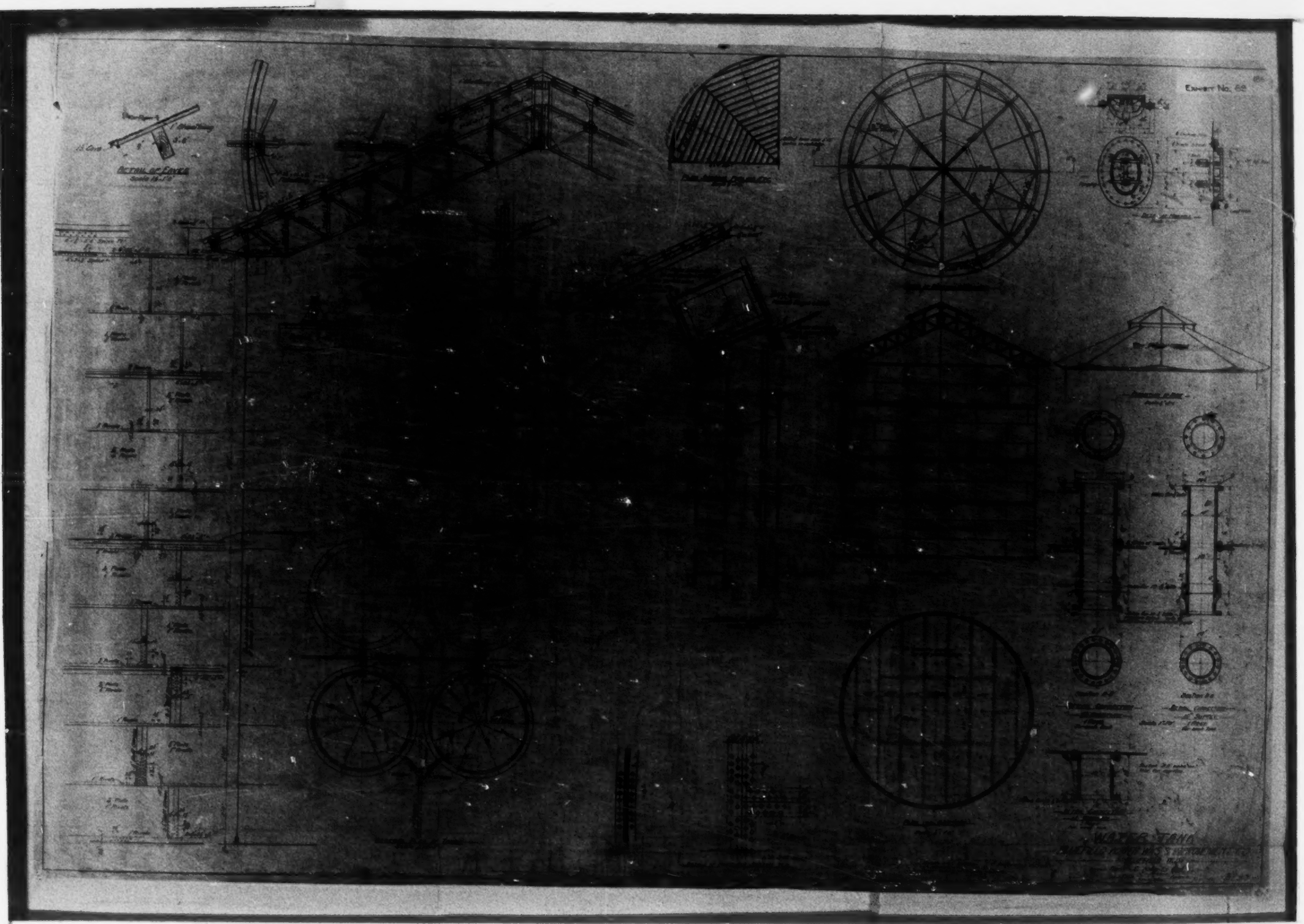


Exhibit No. 68
WATER TANK

638 EXHIBIT No. 68.

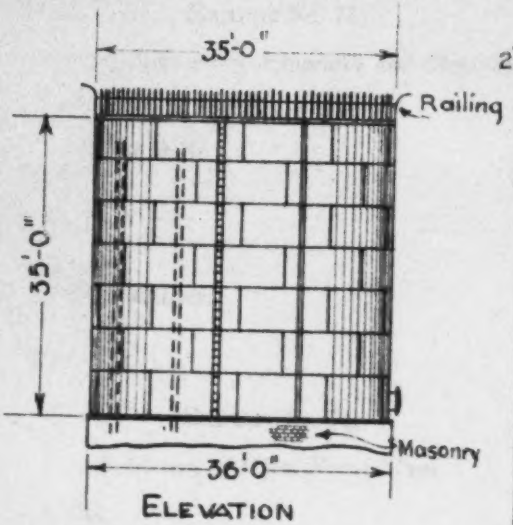
Itemized List of Hydrants, January 1, 1915.

Size.	Kind.	No. in use.
4"	Eddy	15
4"	"	7
4"	"	3
4"	"	8
4"	"	10
4"	"	6
4"	"	2
4"	Corey	6
4"	"	2
4"	"	4
6"	"	1
6"	"	9
8"	"	45
		118

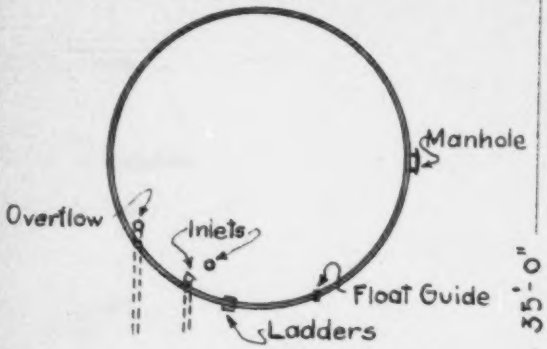
(Here follows Exhibit No. 69, marked page 639.)

DETAIL OF BLAND STREET STANDPIPE

Exhibit No. 72



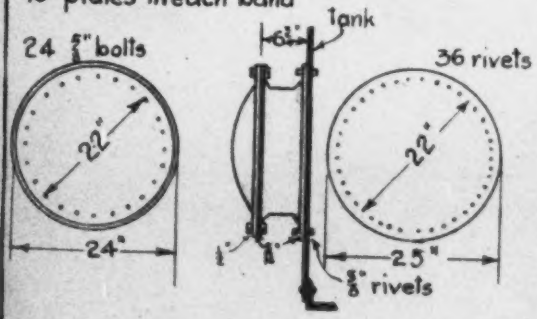
ELEVATION



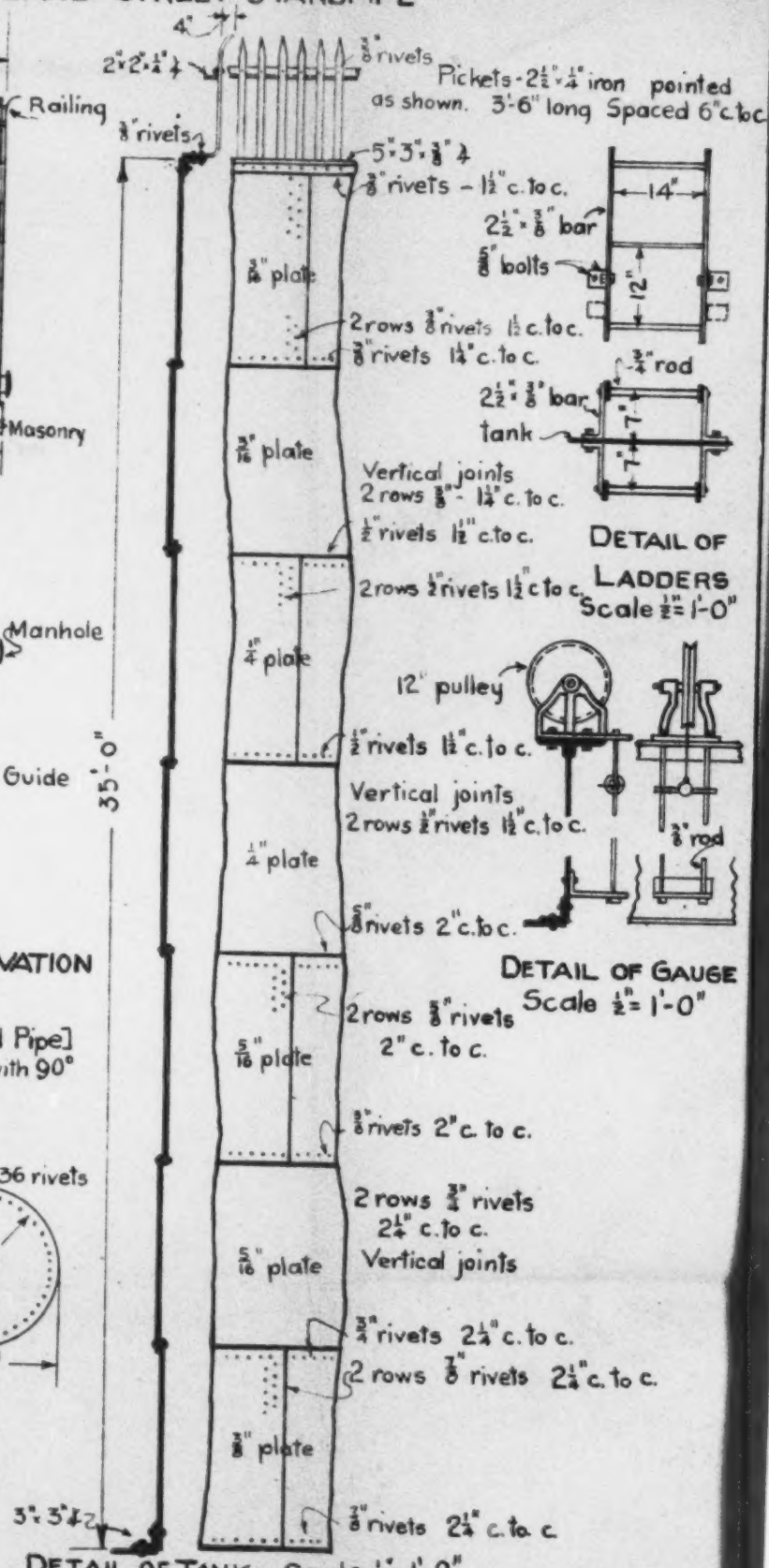
SECTIONAL PLAN

GENERAL PLAN & ELEVATION
Scale 1" = 20'

10" C.I. Overflow 1' from top [Flanged Pipe]
6" C.I. Inlet in tank 3' from top H.&S. with 90° bend at top.
10 plates in each band



DETAIL OF MANHOLE
Scale ½" = 1'-0"



DETAIL OF LADDERS
Scale ½" = 1'-0"

DETAIL OF GAUGE
Scale ½" = 1'-0"

DETAIL OF TANK Scale ¼" = 1'-0"

1943

642 EXHIBIT No. 73.

Inventory Laboratory Apparatus and Chemicals.

Equipment:

1 Double Wall Dry Bath.
2 Bake Ovens.
1 Copper Tray.
1 Incubator.
1 Hot Plate.
1 Food Chopper.
1 Arnold Steam Sterilizer.
Balance.
Apparatus.
Chemicals.

643 EXHIBIT No. 74.

Inventory of Office Furnishings.

1 Flat Top Desk.
1 " " "
1 " " "
1 Roll Top Desk.
1 " " "
1 " " "
2 Desk Trays.
1 Monarch Typewriter.
1 " "
1 Typewriter Chair.
1 Table.
1 "
1 "
1 Filing Cabinet.
1 " Case.
1 " "
5 Office Chairs.
4 Chairs.
1 Revolving Chair.
1 Oil Stove.
1 Card Index.
1 Book Case.
1 Adding Machine.
1 Eyelet Machine.
2 Letter Presses.
1 Letter Press Stand.
1 Letter Book Back.
2 Customers.
2 Granite Cuspidors.

EXHIBIT No. 74.—*Continued.*

3 Sponge Cups.
1 Stamp Rack.
1 Arm Rest.
2 Rulers.
1 Letter Opener.
5 Sand Busch Wells.
3 Stamp Pads.
1 Iron Safe.
1 " "
1 " "
3 Baskets.
3 "
3 Daters.
1 Postal Scale.
1 Letter Box.
2 Wall Map Racks.
1 Map Rack.
1 Office Door Mat.
9 " Window Shades.
9 Metal Window Screens.
1 Screen ~~Door &~~ Transom.
644 2 Awnings, complete.
1 Double Well Base.
1 Cut Pin Cup.
1 Finger Moistener.
1 Receipting Stamp.
1 City Directory.
1 Dictionary.

Surveying Instruments:

1 Transit.
1 " & Tripod.
1 Level & Tripod.
2 Sight Rods.
1 Extra Tripod.
1 Drawing Board and Stand.

645 EXHIBIT No. 75.

Inventory of Material & Supplies at Ada Pumping Station.

210 lin. ft. 10" C. I. pipe.
Total wt. of above pipe 12,600 lbs.

1 10" C. I. gate valve.
2 1½" brass unions, flanged.
1 2" " " "
1 3" " " "

EXHIBIT No. 75.—*Continued.*

2 2½" Couplings.
4 2" "
2 3" unions, flanged.
2 2" " "
4 1½" " "
8 1¼" " "
1 4" plugs.
11 2" "
2 4" ells.
10 2" "
10 1½" "
8 1¼" "
6 2" 45° Bends.
8 1½" 45° "
12 1" 45° "
7 ¾" 45° "
5 ½" 45° "
3 3" to 2½" Bushings.
2 3" to 2" "
2 2½" to 2" "
20 2" to ¾" "
7 1½" to ½" "
1 3 x 3 x 1¼" tees.
8 3" "
2 2" "
4 1" "

Miscellaneous:

13 3" Boiler Flues.
17 ft. 4" Wrought Iron pipe.
7 ½" Turn Buckles.
80 2½" Frame Pulleys.
528 large concrete blocks (8 x 10 x 24).
92 small " " (8 x 10 x 12).
5,000 tile shingles (6½ x 13 x 2).
100 Tons Coal.

646 Miscellaneous Valves:

1 3" Interchangeable Globe.
8 1½" " "
2 1" " "
13 ¾" " "
3 1½" Gate Valves.

Tools & Equipment:

1 Automatic Flue Cleaner.
1 3 ton chain Hoists.

EXHIBIT No. 75.—*Continued.*

2 Gasoline Torches.
1 Set 1¼" Block & Tackle.
1 #30 Ft. Extension Ladder.
1 Pipe Vise.
1 Portable Forge.
100 ft. 2" Line Hose.
1 60 lb. Anvil.
4 Iron Bed Wheelbarrows.
1 Bench Vise.
1 Bung Borer.
1 18 ft. ¾" Log Chain.
1 20 ft. ⅜" " "
1 Bellows.
5 Screw Jacks.
1 Flue Roller.
1 Pair Pipe Tongs.
1 Flue Cleaner.
1 60 Gal. Oil Tank.
1 50 " " "
1 5 " " "
50 ft. ½ Bluestone Water Hose.
1 14" S. Wrench.
1 5/16 Square Shank Drill.
2 9/16 " " "
1 ⅝" Taper Tap.
2 3½" Open Wrenches.
1 3" " "
1 4" " "
1 4½" " "
6 Socket Wrenches.
5 Side Socket Wrenches.
1 24" Stilson "
1 18" " "
1 2½" x 2¼" Open Wrench.
1 1⅝ x 1½" " "
1 1⅜ x 1¼" " "
1 1⅛ x 1" " "
1 ⅞ x ¾" " "
1 ⅜ x 9/16" " "
1 ⅜ x 5/16" " "

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2 10" Monkey Wrenches.
2 12" " "
2 6" " "
1 Valve Seat Socket Wrench.
7 Valve Wrenches.
1 Iron Stop Box Wrench.
2 Valve Seat Wrenches.

EXHIBIT No. 75.—*Continued.*

5 Cut Off Wrenches.
1 Socket Wrench for 5/8" Nut.
1 " " " 1/2" "
1 lb. Machinist Hammer.
3 Tallow Caps.
1 5 Gal. Oil Can.
1 2 " " "
1 1/2 Pint Oiler.
1 10 lb. Copper Matter.
1 Blow-off Valve Wrench.
2 Lash Bars.
2 Scrappers.
2 Fire Hooks.
2 Brass Pyrene Fire Extinguishers.
1 Lawn Morwer.

At Shop.

10 1" Corporation Stops, Flanged.
46 3/4" " " "
10 1/2" " " "
4 1" " " Plain.
9 3/4" " " "
13 1/2" " " "
18 3/4" Curb Stops, Plain.
19 1/2" " " "
24 1/2" " " Flanged.
12 1/2" brass unions.
13 1/2" " " , lead flanged.
5 1" brass plugs.
12 3/4" " "
43 1/2" " "
3 2" unions.
8 1 1/2" "
6 1 1/4" "
10 3/4" "
10 1/2" "

648

7 2" tees.
13 1 1/2" "
11 1 1/4" "
10 1" "
14 3/4" "
94 1/2" "
13 2" Ells, plain.
11 1 1/2" " "
14 1 1/4" " "
33 1" " "

EXHIBIT No. 75.—*Continued.*

62 ¾" " "
42 ½" " "
8 1" Ells, Street.
11 ¾" " "
31 ½" " "
56 1½" Couplings.
96 1¼" "
26 1" "
26 ¾" "
15 ½" "
10 1½" Plugs.
5 1¼" "
10 1" "
7 ¾" "
6 ½" "
12 1" to ½" bushings.
8 ¾" to ½" "
5 2" Service Clamps.
8 1½" " "
17 1¼" " "

Miscellaneous:

40 ¾" Goose Neck Couplings.
39 ¾" Soldering Nipples.

Tools & Equipment:

3 Chisel Bars.
2 Pair Calipers.
1 " 8" Compas-es.
2 Lanterns.
2 10" Screw Drivers.
2 12" " "
2 Pipe Vises.

649

1 Buffalo Down Draft Elec. Forge.
1 97 lb. Anvil, Smith Tools, Etc.
1 #3 Tapping Machine.
2 ½" D. R. & T. Mueller Threads.
1 1 Ton Weston Chain Hoist.
1 #1 New Style Smiths Tapping Machine.
9 Steel Figure Sets.
1 Bronz- Test Nozzle.
50 Ft. 4 Ply Water Hose.
1 Set Little Grant Screw Plates.
2 Toledo Stocks & Dies.

EXHIBIT No. 75.—*Continued.*

2 Millers Adjustable Die Stocks.
2 Pair Chain Tongs.
2 Lead Laddles.
1 Set Painters Hooks.
2 16 lb. Sledges.
4 Iron Bed Wheelbarrows.
4 Pinch Bars.
2 Bench Vises.
3 Steel Squares.
1 Lufkin Lumber Rule.
1 Pair Ellis Pipe Cutters.
1 Force Pump.
1 Lead Furnace & Kettle.
1 " "
1 Jointing Plane.
2 Soldering Rims.
2 Plastering Trowels.
2 Tapping Machines.
2 Pair Ratchet Dies.
1 Deeming Pump.
3 Scythes & Snaths.
3 Hatchets.
1 Coke Fork.
1 50 ft. Tape Line.
1 Drawing knife.
1 Inspectors Gauge.
1 Piezometer.
2 Handled Axes.
1 5 ft. wide Cross Cut Saw.
1 6 " " " " "
25 S. H. Shovels.
1 L. H. "
25 Pick & Handles.
1 #2 Lauds Droughan Pump.
1½ 1½" Solid Center Brace Bit.
1 Standley Butt Gauge.
1 7/16 Arrow Brace Bit.
650 1 ⅜ Brace Bit.
1 Marking Gauge.
1 6" Zigzag Rule.
1 Brass Plumb Bob.
1 #2 Barnes Pipe Cutter.
3 24" Stilson Wrenches.
2 18" " "
3 14" " "
4 10" " "
1 8" " "
2 6" " "

EXHIBIT No. 75.—*Continued.*

2 1" Drills for Tapping Machine.
2 ¾" " " " "
3 ½" " " " "
3 Ratchet Drill Stocks.
1 1¼" Twist Drill Bit.
1 1" " " "
3 ⅞" " " "
2 11/16" " " "
2 ⅝" " " "
3 13/16" " " "
1 Brace Bit.
3 Cutting Hammers.
6 8 lb. Stricking Hammers.
4 Caulking Hammers.
1 Yarning Chisel.
4 Hand Saws.
1 Rip Saws.
1 #146 B. S. Drill.
1 #1 Sanders Pipe Cutter.
1 #2 " " "
40 Ft. 1¼" Steel.
1 Meter Testing Machine.
1 ⅛" Pipe Tap.
1 ¼" " "
1 ⅜" " "
1 ½" " "
1 ¾" " "
1 1" " "
1 1¼" " "
1 1½" Pipe Tap.
1 2" " "
1 60 lbs. Bench Vise.
2 Telephone Spoons.
15 Ft. 2" Suction Hose.
2 Brass Pyrene Fire Extinguishers.
1 Pair 8" Pliers.
1 Mitre Box Saw.
1 Combination Plane.
651 1 Smoothing Plane.
1 Jack Plane.
1 Fore Plane.
1 Jointing Plane.
1 Oil Stove.
1 Buffalo Fire Extinguisher.
1 Grind Stone.
1 Set Green River Screw Plates.

EXHIBIT No. 75.—*Continued.*

Meters in Stock:

1 4" Gem.
1 2" Gem.
24 5/8" Empire.
4 5/8" Keystone.
20 5/8" Niagara.
1 5/8" Gamon.
2 1" Neptune.
1 1" Keystone.
1 1" Nash.
3 5/8" Neptune.
1 2" Neptune.
1 1½" Neptune.
1 1" Lambert.

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At Pipe Yard.

231 lin. ft. 10" C. I. pipe.
806 " " 8" " "
956 " " 6" " "
200 " " 4" " "
600 " " 3" " "

Total wt. of above pipe 96,878 lbs.

Cast Iron Specials:

3 6" "Y" branches.
9 4" " "
4 3" " "
3 10" Ells.
1 8" "
9 6" "
12 4" "
13 3" "
1 10" 45° Bends.
1 8" " "
4 6" " "
7 4" " "
9 3" " "

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3 10" sleeves.
12 8" "
4 6" "
27 4" "
30 3" "

EXHIBIT No. 75.—*Continued.*

1 10" tees.
2 6" "
16 4" "
13 3" "
3 10 x 10 x 6" tees.
4 10" to 8" reducers.
2 8" to 6" "
6 6" to 4" "
1 6" to 8" increasers.
7 3" to 4" "
2 10 x 10 x 6 x 6" crosses.
6 10 x 10 x 6 x 6" "
1 8 x 8 x 8 x 8" "
3 4 x 4 x 4 x 4" "
4 10" Caps.
1 6" "
4 4" "
6 3" "
1 10 x 10 x 8" split sleeves.
1 6 x 6x 4" " "
1 8" " "
3 6" " "

Wt. of above Specials 119,763 lbs.

1 8" Machine Valve.
1 6" " "
1 4" " "
1 10" C. I. Gate Valves.
2 10" " " "
1 8" " " "
14 6" " " "
2 4" " " "
2 3" " " "

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9 8" C. I. Pat. Plugs.
13 6" " " "
8 4" " " "
1 6" fire hydrant.

Miscellaneous:

103 Sec. 18" vit. tile pipe.
252 Ft. ½" Galv. pipe.
6,800 Paving Brick.
20 Tons Coal.
Lin. Ft. Iron Fence.

EXHIBIT No. 75.—*Continued.*

Tools & Equipment:

1 Extension Tool.
1 Road Plow.
1 Drag Scraper.

Lumber:

68 pcs. 2 x 8 x 12.
26 " 2 x 8 x 14.
3 " 2 x 12 x 12.
8 " 2 x 10 x 14.
90 " 2 x 6 x 12.
50 " 2 x 4 x 16.
80 " 2 x 4 x 14.
100 " 2 x 4 x 12.
50 " 4 x 5 x 7.
1,760 bd. ft. Hickory Boards.
2,280 " Walnut "
426 " Oak "
10,800 " 1" Boards.

653*a* *Report upon the Value of the Water Works Properties of the Bluefield Water Works & Improvement Company Bluefield, W. Va., January 1st 1915.*

John W. Alvord,

Chicago.

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653*d* *Report.*

654 Mr. William McCarthy, Supt.,
Bluefield Water Works & Improvement Company,
Bluefield, W. Va.

DEAR SIR:

I would respectfully report that at your request I have made a valuation of the properties of the Bluefield Water Works & Improvement Company, and present herewith my detailed report on same. My estimate is based upon:

First. Complete inventory of the property of the Bluefield Water Works & Improvement Company as of date January 1st, 1915, prepared under my direction by Mr. A. T. Luce of my office.

Second. Personal examination of the property, the community served, and the conditions under which the property is being operated.

Third. The study of the operating statistics, local prices and unusual conditions affecting the value of the property.

I have estimated the cost of reproduction of the property less depreciation, based upon the present rate of return, to be $540,259. After a careful study of the plant and surrounding conditions,
655 I have come to the conclusion that the existing plant is worth not less today than it would cost to rebuild, less its depreciation.

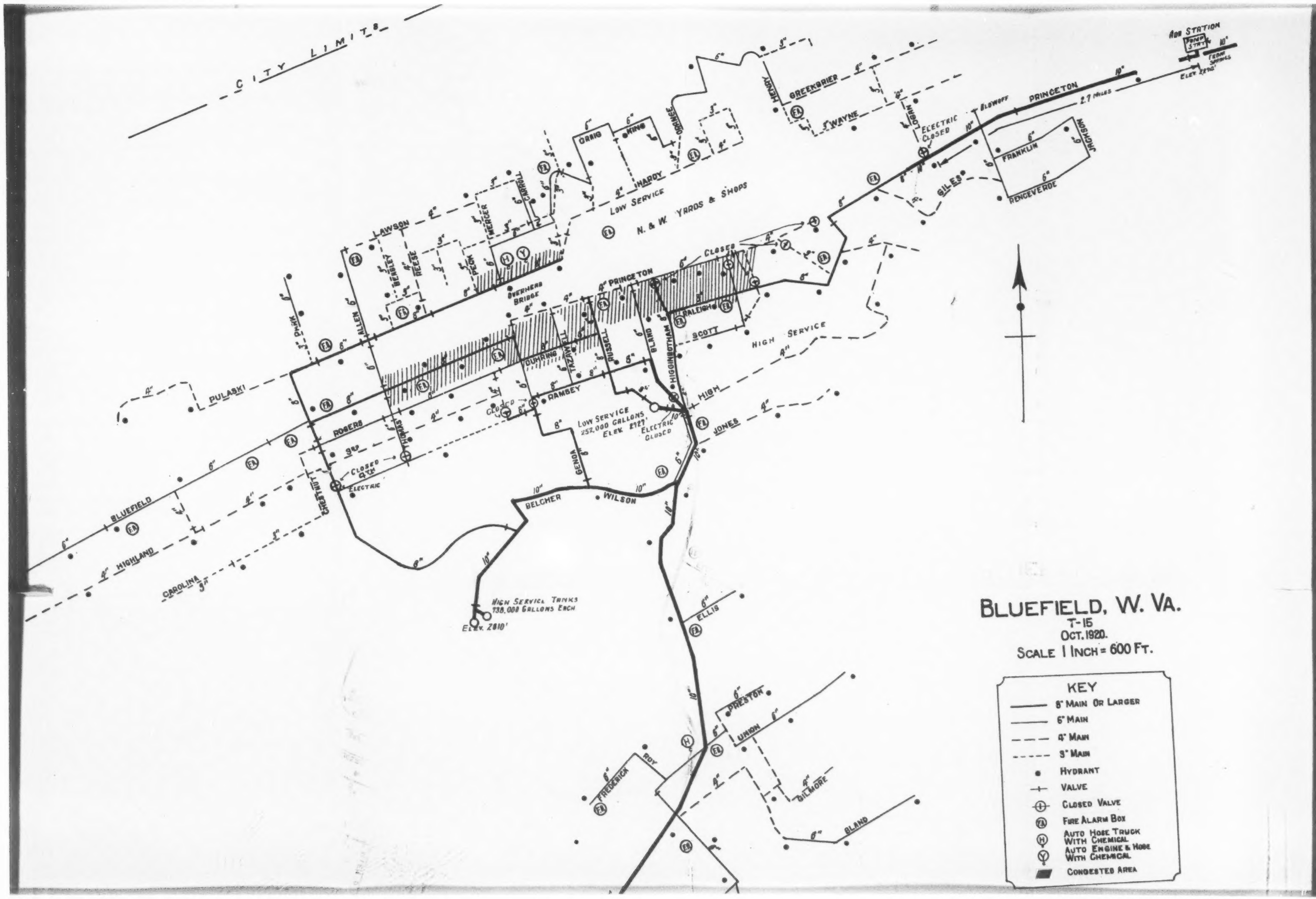
It is finally concluded that the value of the properties of the Bluefield Water Works & Improvement Company, as of January 1st, 1915, is, in round numbers, not less than five hundred and forty thousand dollars ($540,000).

Respectfully submitted,

JOHN W. ALVORD,
Consulting Engineer.

Chicago, Illinois, February 3rd, 1916.

(Here follows map of Bluefield marked page 656.)



BLUEFIELD, W. VA.

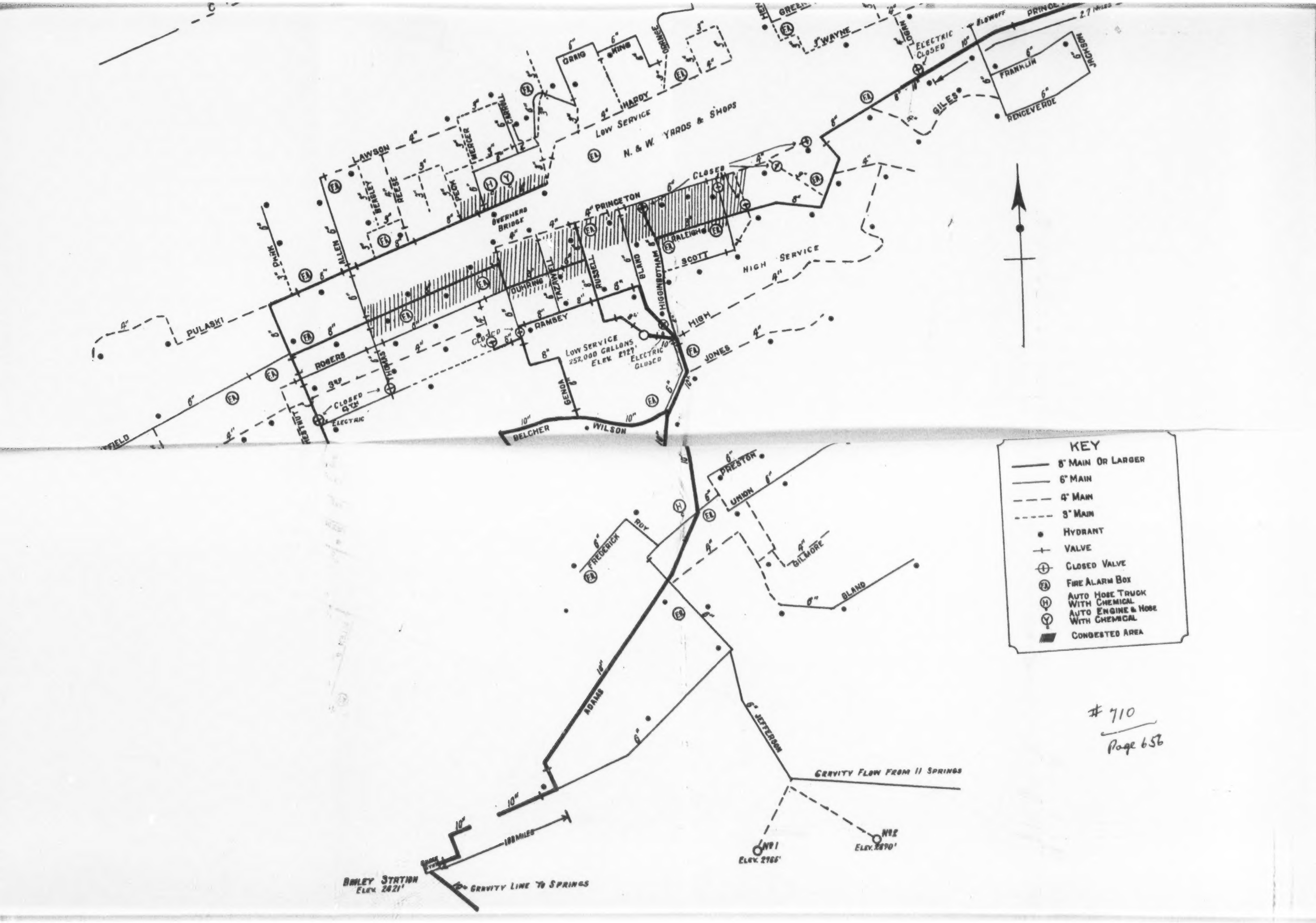
T-15

OCT. 1920.

SCALE 1 INCH = 600 FT.

KEY

- 8" MAIN OR LARGER
- 6" MAIN
- 4" MAIN
- 3" MAIN
- HYDRANT
- VALVE
- CLOSED VALVE
- FIRE ALARM BOX
- AUTO HOSE TRUCK WITH CHEMICAL
- AUTO ENGINE & HOSE WITH CHEMICAL
- CONGESTED AREA


N. & W. YARDS & SHOPS
LOW SERVICE
HIGH SERVICE
ELECTRIC CLOSED
BLOWOFF
PRINCE
2.7 MILES
FRANKLIN
JACKSON
RENGEVERDE
GILES
GREEN
ST WAYNE
OWEN
CRAIG
KING
HARDY
ORANGE
CHERRY
MERCER
LAWSON
BERKLEY
REESE
PECK
OVERHEAD BRIDGE
8" PRINCETON
CLOSED
RALEIGH
SCOTT
ALLEN
PINK
PULASKI
ROGERS
DUNHAM
TAZEWELL
RUSSELL
BLAND
HIGGINBOTHAM
RAMSEY
CLOSED
LOW SERVICE
252,000 GALLONS
ELEV. 2727'
ELECTRIC
CLOSED
HIGH
JONES
HORNE
CLOSED
ELECTRIC
GENOA
BELCHER
WILSON
PRESTON
UNION
ROY
FREDERICK
GILMORE
BLAND
ADAMS
JEFFERSON
GRAVITY FLOW FROM 11 SPRINGS
NO 1
ELEV. 2965'
NO 2
ELEV. 2890'
1.88 MILES
BAILEY STATION
ELEV. 2621'
GRAVITY LINE TO SPRINGS
KEY
8" MAIN OR LARGER
6" MAIN
4" MAIN
3" MAIN
HYDRANT
VALVE
CLOSED VALVE
FIRE ALARM BOX
AUTO HOSE TRUCK WITH CHEMICAL
AUTO ENGINE & HOSE WITH CHEMICAL
CONGESTED AREA

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657 Part I.

The Report.

Fundamental Principles of Public Utility Valuation on Which This Valuation is Based.

The art of valuation of public utility property is a special study in three fields of knowledge:

(A) A knowledge of the law; especially its fundamental principles as affecting "property."

(B) A knowledge of finance, that is to say, the economics of business, including investment, the varying value of money, and the special hazards of various enterprises and the economic operation of utility properties.

(C) A knowledge of engineering with especial emphasis on that branch of engineering that deals with the conceiving, planning and building up of utility structures, involving a knowledge of costs and methods both in construction and operation.

The function of valuing a public property consists essentially of two distinct operations:

First. The collection of all the facts and evidence tending to throw light on the question in hand.

Second. The judicial operation of weighing the facts and evidence, apportioning to each line of evidence its relative degree of importance, and reasoning from this summation to the broader question of value. In valuation work, much confusion of thought arises from the very human anxiety to reason on the broader question before all the data is accumulated, properly digested, and placed in its proper perspective.

658 First. The facts and evidence desirable for a full understanding of the value of a utility property are as follows:

(1st.) The cost to replace the property at the present time as a going concern.

This line of investigation requires:

"A." An inventry of the present existing physical property, used and useful for the purpose of the utility.

"B." A knowledge of its earnings and expenses for a preceding series of years, and the knowledge of the amount of return that will attract capital into the business.

"C." Computation of the cost to replace the property and reproduce its income as a going concern, in a way which is humanly possible.

"D." An estimate of the loss of value in the existing property, by reason of prospective change in the requirements of the public, advances in the arts, age, or the necessity for replacement.

(2nd.) The market value of the securities of a property where a broad and representative market for such securities can be said to exist.

(3rd.) A consideration of the value of other properties similarly situated, where such value has been carefully and fully determined. This can be used only as a general check, however.

659 (4th.) The conditions which surround the particular property to be valued, such as the following:

1st. Character and enterprise of the population, its past growth and present business enterprise.

2nd. The presence or absence of judicious management of the utility property, and its conservative extension.

3rd. Freedom of the property from mishaps.

4th. The cost of next nearest available supply.

5th. The value of the service to the individual consumer.

6th. Competition, if any, and possible future contingencies arising both from changes in public demand or substitution of other supplies more acceptable to the population.

7th. The legal status of the property and attitude of the public and their representatives toward it.

(5th.) Past Cost Evidence.—In the theory of the law we are seeking the present value of the property, and unless past cost is recent past cost, it has no bearing on the inquiry except as it throws light on what present value would be.

Second. The judicial reasoning which should follow the compilation of these lines of inquiry is as follows:

(1st.) To be assured that the evidence is without material error

660 (2nd.) To determine the amount of credence to give to the witnesses who introduce evidence. This may be based largely on the extent of their practical experience in the matters in hand, the extent of their general experience, as well as their conscientiousness and freedom from bias.

(3rd.) To determie that each independent line of cost evidence introduced is in itself logical and complete, and is not confused with any other line of evidence, such as the mixing up of past cost with present cost to reproduce, etc.

(4th.) To decide what weight should be given to various lines of evidence introduced.

(5th.) To determine in each case if the line of evidence is a measure of value. If not, to reason why not.

(6th.) To determine in particular, if the cost of reproduction, including the cost of reproducing the present income of the company is, or is not, a reasonable measure of value.

661 (7th.) To finally conclude value as a matter of common sense, based on a broad and adequate review of all the facts, with an open mind, and in a judicial manner.

(8th.) To check the value so obtained by such lines of inquiry as will properly be of aid.

Reasoning from Cost to Value.

Having outlined the evidence as to value, it is next desirable to reason from these lines of evidence to value itself.

It may be taken axiomatically that where a property is properly serving a real need in an assured community with efficiency and with no immediate prospect of change in its methods or alteration in the source of supply or the demand, and with no serious mistakes in its construction or financing, that it must be worth something more than the actual cost to reproduce it up to its present state of efficiency.

The cost of reproduction conscientiously carried out presents a faithful and practical picture of what the city or utility would face if they had to build a new plant today, but like the existing plant in all respects. It considers both depreciations and appreciations, some of which are shown below:

662

Losses to utility, gain to public.	Gains to utility, losses to public.
Obsolete structures—Once valuable, now discarded.	Increased cost of land.
Expenditures originally thought wisely made but proving to be otherwise.	Increased difficulties of building plant in more dense population.
Higher prices paid for materials in the past.	Higher prices for labor and certain materials.
Losses due to "wear and tear."	Necessity of cutting through and replacing pavements.
Inadequacy due to rapidly increasing population.	Necessity of crossing under railroad which perhaps did not exist when the plant was built.
Obsolescence due to introduction of more efficient appliances.	
Depreciations of all kinds.	Appreciations of all kinds.

Clearly, if we must, by the force of correctly reasoned and carried out reproduction, eliminate all the obsolete expenditures, the mistakes of the past, the depreciation which property has suffered, we

must, as well, find the cost of reproducing the property under the present conditions, with full allowance for such obstacles as the present conditions impose upon us.

General Conclusions.

In weighing evidence as to value, it is important to remember:

663 1st. That value after all is a matter of informed and intelligent opinion.

2nd. That cost is not necessarily value.

3rd. That the courts uniformly have insisted that it is the present value, or value now, that must control.

4th. That reproduction is the nearest line of evidence to produce value now.

5th. That cost of reproduction is not necessarily value now, as a plant may be worth more or less than the cost to reproduce it now.

6th. That the value of the evidence of witnesses is in direct proportion:

(*a*) To the extent of their practical experience.

(*b*) To their breadth of view in other directions than their own profession

(*c*) To their lack of bias, as shown by their past record and testimony.

To recapitulate then, some general considerations on the art of valuation of public utilities may be summed up as follows:

1st. Caution should be observed not to reason about value until all of the evidence is in.

663½ 2nd. The cost evidence consists of the inquiry as to the cost to reproduce new, less depreciation at the present time, the cost of the plant in the past if it is recent, the cost of other plants similarly situated, the value of stocks and bonds if an adequate market exists.

3rd. In reasoning from cost to value from the lines of evidence above mentioned, careful consideration should be given to surrounding influences, not readily expressed by figures, such as, the evidence of good management, adaptation of plant to public needs, growth and future development of district served, adequacy of plant to that population and its future, and cost of next nearest method of supply possible of future displacement by changing public needs or demands.

(Here follows "Wage Curve," marked page 664.)

665 Application of These Fundamental Principles to the Water Works Properties of the Bluefield Water Works and Improvement Company.

It must be borne in mind that the principles which are here outlined cannot be applied to any individual case in an empirical way, but each specific case must be investigated and judged upon its own conditions.

Before undertaking to reason out the value of the water works property of the Bluefield Water Works and Improvement Company from the cost evidence, certain local facts must be considered which can not be properly expressed in figures.

1st. The available water supply at Bluefield is limited and unusually valuable.

2nd. The works are serving the city with good and wholesome water for domestic and manufacturing purposes. The operation of the water works is under intelligent control. It is an unusually and increasingly expensive proposition to supply Bluefield with water.

3rd. The plant is well laid out to protect the locality of greatest fire hazard, the elevation of the twin tanks being such that adequate water is furnished at good pressure for fire fighting purposes, in the business and high class residential districts.

4th. Bluefield situated as it is in a rich coal mining district, has had a steady and substantial growth, and there seems to be no reason why this growth should not continue. The city is the
666 highest point on the Norfolk & Western R. R. and its growth has kept pace with that of the business of the railroad, which at present handles over 1,000 cars of coal per day.

5th. The Bluefield cast iron distribution system has been systematically laid out and shows no waste or unnecessary duplication. It will require no replacement for a long period to come, and is therefore, an investment of a particularly permanent character.

6th. The water works service in Bluefield is "needed", that is to say, if the City of Bluefield were not served by the Bluefield Water Works & Improvement Company, it would have to immediately install a water works system of a similar kind and capacity to that existing.

7th. The water service is worth to the consumer much more than the rates charged by the Water Company, for in no other way could he transport water from the source to his faucet under pressure by his individual initiative or by any other method as cheaply as he can obtain the same service from the present plant.

8th. The elevation to which most of the water supply is lifted is very great. The pumps at the Ada Station normally operate against a pressure of 305 pounds per square inch—about four times the head

pumped against in the ordinary water works plant. This materially increases the cost of pumping over that in the average plant. The pump at the Beaver Pond Station normally operates against 350 feet head, which is nearly twice the lift of the average water works.

9th. The yield of the net income of the plant for the year ending December 31, 1914, after allowing 1% for depreciation is only 2.7% upon the value here found, which is far from being sufficient return to attract capital into an investment of this character.

667 10th. At the present time the Company has acquired practically all springs within reasonable distance of Bluefield that will yield water and still finds the supply becoming insufficient during the dry seasons. A considerable investment will, therefore, have to be made in the near future (estimated at about $240,000) for the proper additional future supply of the town, which investment will not add materially to the revenues at the present time.

In the case of the Bluefield Water Works & Improvement Company, the future supply must be drawn from greater distance than the present supply and from lower elevations. The available sources are:

1st. The Bluestone River;

2nd. Mud Fork;

3rd. Brushy Fork;

and

4th. Possibly deep wells north of the City.

In the case of the surface supplies, the water must be filtered. In all cases it will have to be lifted great heights and delivered through long pipe lines. Some study has been given to these local conditions and it has been found that either of the above sources of supply is much less valuable than the present source, and will not displace it but will only supplement it as the demand for more water grows with increasing population. It would, therefore, seem that the minimum value of the plant is strongly indicated by the fair cost of reproducing it.

668 Other Considerations Governing Value.

There are several features in connection with the property of the Bluefield Water Works and Improvement Company which require special consideration in an appraisal such as is here being made.

The placing of a value upon the water rights in the springs, that is, the value of the water only, or the value above the cost of development of the springs is a matter requiring considerable thought and study. There are two main groups of springs, one group flowing into the Bland Street tank by gravity, known as the gravity springs, and the other group, the Ada Springs, flowing to Ada Pumping Station

from which their supply is pumped into the tanks, whose elevation is from 450 to 550 feet above that of the pumping station.

It is the belief of many people in Bluefield that the value of these springs is as high as $5,000 or $10,000 each, but such figures are not substantiated as a result of a careful study of local conditions effecting the value of the spring. While it is true that all springs have some special value outside of the mere cost of development, there is no average figure that can apply. The value of any one spring is dependent upon three factors, namely, the amount of its dry weather flow, its distance from the tanks, and its elevation. Considering these three factors, it is at once obvious that the gravity group of springs is of much more value than the Ada group by virtue
669 of the fact that they flow into the Bland Street tank without any pumping expense, while the supply from the Ada Springs is lifted against a large head. The gravity springs are also located much nearer the tanks and the pipe, or investment necessary to develop them is much less than is the case with the Ada group.

In studying the value of these springs, it is helpful to know the cost of water delivered from the most next available source of supply, which in this case is believed to be the Bluestone River above Graham. If we find the cost of water from this source properly filtered and delivered at a common point like the Twin Tanks to be less than the cost from the present source, then the springs would have little value, but if we find the contrary to be true then they will be worth at least the difference in cost of water after proper development and delivery to the Twin Tanks. In studying this matter, however, it is found that the springs do have a greater value than the Bluestone supply and the proper value to be added to the value of the land and development has been found by comparing this source of supply with the Bluestone source of supply as that is believed to be the next most available source that is certain. The relative value of the gravity group of springs and the Ada Springs has been apportioned on the basis of the cost of water from the two groups, the value per group being in inverse ratio to the cost of water. Having thus apportioned the total value to each group
670 of springs, the value per group is apportioned between all the springs in each group, the value of each gravity spring being determined by the amount of its flow, its distance from the tanks, and its elevation, and the value of each Ada Spring by the amount of its flow and its distance from the tanks, the question of elevation being neglected since all the Ada supply is pumped the same height.

As a result of a careful study along the lines outlined above, it has been shown that the value of the springs is not as large as perhaps many of the people of Bluefield who have had springs to sell seem to believe.

Another feature is the fact that the cost of spring development is unusually high owing to the rough nature of the country and the rock encountered in excavating for pipe lines and buildings.

Bluefield is on the summit of a divide and there are very small water supplies around or near the city without going downhill and

a long way for it, thus necessitating unusually high investment charge and operating expense. The rough character of the town site necessitates many different elevations of service, a fact which does not enter into consideration on the part of the ordinary or average plant.

Procedure in Estimating the Cost of Reproduction.

As it seems inevitable that the cost of reproduction is the most important line of evidence from which to reason value, in this case special attention has been given to this line of evidence.

671 In reproducing a plant and property, the following principles must apply:

1st. The reproduction must be along lines which are humanly possible, and in accord with practical experience.

2nd. It is entirely an estimating process, and therefore, to be correct must be founded on a long and wide experience in actual works.

3rd. It is based on a working plan, in which the time adopted for the process is a most important element.

4th. A reproduction, to be practical, must be predicated upon a reasonable construction and development period in the near future, and then reduced to present worth where necessary.

5th. The costs for this near future must be based upon the prices of the recent past, just as any engineer entering into new work determines the probable future costs.

6th. The reproduction is not complete until the plant is financed to a paying basis.

The essential feature of reproduction involves the actual process step by step, of constructing a duplicate plant, which, when completed in a reasonable and workable period of time will be exactly similar to the one under construction in both physical and earning capacity.

In rebuilding the plant of the Bluefield Water Works & Improvement Company, it would be necessary, first of all, to form a conservative working plan or schedule of operations which will be practicable and possible. This schedule in this case is outlined as follows:

672 Time of Construction.

It is assumed that the plant is first originated on January 1st, 1915 (the date of this estimate), and that the physical plant is constructed complete in one year from that date or January 1st, 1916.

It is believed from experience that at least four months would be occupied in preliminary investigation and in general engineering and business investigations and in negotiations with the city pre-

paratory to the passing of the necessary franchise ordinance. During this time, the necessary real estate would have to be purchased, detailed engineering plans for construction would be drawn, contracts for the construction of the springs with their pipe lines to the city would be advertised and let, and work would be commenced upon them immediately. Contracts for the distribution system and station buildings would be let in May and the construction work on these parts of the plant would begin June 1st. As soon as the progress on the station building would permit, the machinery could be installed. The work on the pipe system and tanks, as well as the installation of pumps, boilers and piping would be completed late in December, a month or six weeks after the completion of the work on the water supply, so that the entire plant would be thrown into operation on January 1st, 1916.

673 The physical plant would then be identical with the present physical plant of the Bluefield Water Works & Improvement Company. In the same manner, the income of the plant must be acquired and developed until it is equal to that of the existing plant. It is estimated that four years will be required for this purpose and that by January 1st, 1920, this hypothetical plant would be identical financially as well as physically with the now existing plant.

The appraiser's responsibility is precisely the same as that which he would have to encounter as an engineer in planning and constructing any piece of new work with which he might be charged. He is much concerned with the proper selection of unit prices, and it is deemed expedient to briefly discuss the selection of fair and reasonable "unit prices".

674 Unit Prices.

In a reproduction estimate, unit prices must be selected on the theory of wholesale construction, rather than of piecemeal construction. Those are the "normal" prices for material and labor in Bluefield, based upon the local prices and upon a general knowledge of the fluctuations of these prices from time to time. In the large majority of cases, this normal price is identical with the prevailing market price. Most of the materials entering into the construction of a water works plant do not suffer from considerable market variations. In the case of some items, however, notably cast iron pipe, the fluctuations even during a single year are so rapid as to make it seem unfair and unreasonable to adopt the price at any one moment. One would also have to face the contingency of a rise in prices before it would be possible to let contracts for pipe.

Appended to this report will be found a diagram showing fluctuations in the price of cast iron pipe and pig iron, F. O. B. Chicago, since 1885. From this diagram the fluctuations of the price of pipe in the past will readily be seen and the explanation given above will be more apparent. In order to arrive at the normal price for pipe in the future, one has only the knowledge of the past for a guide, and the prices have, therefore, been based upon the average cost of

pipe in the vicinity of Bluefield during the past five years. The five year Average at Chicago gives a price of $27.36 for 4"; 675 $25.71 for 6" to 12" and $24.94 for 16" and larger. In obtaining the average price for Bluefield, $1.30 per ton was deducted from the Chicago prices to allow for the difference in freight rates.

The following memoranda of prices prevailing in Bluefield, obtained from the City and County engineer and others there, have been helpful principally in observing that no abnormal situation exists:

Common labor	$1.75 per 10 hour day.
Caulkers, yarners	2.25 " " " "
Pipe foreman	3.50 " " " "
Carpenters	4.00 " " " "
Brick Masons	4.50 " " " "
Stone Masons	4.50 " " " "
Teams and Drivers	4.00 to 4.50 per 10 hour day.

Lumber:

Rough chestnut	20.00 per M.
" popular and pine 1" sheathing	19.00 " "
" oak and chestnut 1" sheathing	16.00 " "
Pine trim S4S	35.00 " "
Popular trim S4S	45.00 " "
Pine flooring 7/8" S4S T. & G.	30.00 " "
Brick—Common	8.50 " "
" —No. 1	9.00 " "
" —rough faced	12.00 " "
Fire brick	22.50 to 27.50 per M.
Fire clay	4.50 per ton.
Cement	1.70 per bbl.
Sand	1.30 " cu. yd.
Gravel	1.25 " " "
Crushed stone	1.25 " " "

676 Unit prices in this estimate of reproduction in all cases assume conditions as they exist in Bluefield now, and not in the past. Thus, it will be necessary to cut through pavement, avoid underground obstructions, obtain the benefit of the sewer system, and in many other ways, adopt prices and conditions which did not exist when the plant was built; on the other hand, all obsolete structures which have disappeared are not included.

677 Depreciation.

Depreciation is the loss of value of the Company's property which the courts have said the public must make good through the rates. The public and the Company are, therefore, only interested in ascertaining what the fair amount to be returned to the Company shall be.

Depreciation is more than "wear and tear". It is loss in value due to any cause whatever. Water works structures seldom lose value by "wear and tear"; they are most often rendered obsolete by being outgrown or by changing conditions of public demand. Accordingly, the common interpretation of depreciation as "the decrease in utility value of a structure due to wear and tear" only applies to a very small part of the total loss of value which a plant experiences from age and service.

A piece of pumping equipment, if well maintained, would probably be capable of pumping water for eighty to one hundred years or longer, but observations in a great number of plants have shown that the average pumping engine is commonly discarded after about thirty-five or forty years' service due to the necessity for a larger machine to serve increased population.

As with pumps, so it is with other parts of the plant. A source of supply depends upon its adaptability to the changing demands such as the increased consumption, continued purity, necessity for filtration, development of economical delivery and other factors
678 which may be entirely independent of its ability to meet the conditions for which it was originally developed. The distribution system may be in good condition, but due to growths in population it may in some parts become inadequate for increased consumption in which case it can be increased by larger mains cutting into and through the older system. The computation of depreciation, therefore, involves:

1st. A knowledge of the life of the structure due not only to "wear and tear" but to changing conditions.

2nd. A study of the adaptability of a structure and its ability to perform the work for which it was designed economically and the probable length of time over which it can meet these requirements.

3rd. An allowance in addition to the above two amounts to cover unforeseen expense and contingency which arise through the operation of a public utility property.

The ordinary method of estimating the depreciation of a structure is by means of the "sinking fund". This method assumes that the loss in value of the structure is equivalent to the increase in value of the sinking fund which will amortize the structure at the end of its useful life. The annual addition to the fund each year is considered to be the average annual depreciation, and the accumulation of the fund at any time is assumed to be approximately equal to the amount of the accrued depreciation the structure has
679 suffered at that date. By this method the depreciation small at first gradually increases as the end of the life of the structure is approached.

The "straight line" method, a rough and approximate method sometimes used, involves a simple division of the total value of the structure into a number of parts equal to the number of years which the structure has been estimated to live, and no interest or compounding effect is computed.

The straight line method is, therefore, an inaccurate method as commonly used because interest accretions are not considered. Interest on the annual accretions of a straight line depreciation fund should be credited somewhere to be correctly treated.

The sinking fund method is used in this report.

680 Going Value.

What It Is.

Going Value is a very poor name which is commonly used to define:

(*a*) "The value of a created income,"

or better,

(*b*) "The cost of financing a physical plant into the possession of an adequate income,"

or more definitely and completely,

(*c*) "The cost outside of the physical plant of diverting capital from one path where it formerly earned return into the new line of activity, where, through the medium of the physical property, it may again in time come to earn proper return."

To illustrate this case, if the City of Bluefield should decide they wanted to own the water works property of the Bluefield Water Works & Improvement Company, but were unwilling to offer more than the bare cost of the physical plant, what would be their alternative?

Obviously, first of all, they would have to duplicate it with a plant of equal capacity and efficiency. Now, leaving out for the moment all considerations of rivalry, and assuming that the original or existing plant went out of business when the city was ready to operate it, it will be seen that under no imaginable conditions
681 could they finance this transaction without incurring costs, and losses, the sum of which would have to be added to the physical plant cost.

In the first place, during the year which would be occupied in building, they would lose the income derived by the existing plant now in operation, although to offset this there would be a small saving in interest on such capital as was yet unemployed, but the net loss would be large.

Then after the physical plant was finished, the city would have to begin to operate it at a loss while they were getting customers and building up business. Naturally most large consumers would be quickly taken over, and the first year might show a very considerable proportion of the total revenue to be acquired. The outlying districts, the small consumer, the man who could get a ground water well in his back yard, would, however, be slow to change, and two or three years, in some cases, three or four years, would be

required to recover all of the revenue that would have been enjoyed by the original plant had it continued to do business.

Obviously, a careful accounting of all of these debits and credits would show the financial advantage which the original plant had in the way of income over the cost of building and financing any new plant into possession of such an income.

Such a procedure can be properly outlined and judged by anyone having requisite experience in building and operating plants and obtaining customers.

682 Going value, therefore, consists of the elements of earning power which a plant possesses, growing out of its having an assured business in excess of what any new plant starting without any business would have.

Method of Computing Going Value.

The method of computing going value which is used in this report is as follows:

The comparative method in which the measure of going value is the yearly amounts of revenue reduced to present worth which an old operating plant will produce in excess of what new works of like character can be made to produce between the time of purchase and that time in the future when the revenue of the two works become equal. This method is composed of two parts: first, the assumptions to be derived from the experience in operating similar properties, and second, the accounting which sums up that experience.

If the "Cost of Reproduction" is a logical method of finding the value of the physical plant as the courts have repeatedly held, it is also reasonable to compute the value of the developed business in a similar way, and that has been done in this report by the "Comparative Method."

Estimates of the Cost of Reproduction.

Water Works Depreciation Estimate.

Bluefield, W. Va.

John W. Alvord, Consulting Engineer, Chicago, Ill.

Date, January 1st, 1915.

(Sinking Fund Method, Contributions at End of Year. Interest Compounded Annually.)

Preliminary Cost and Real Estate.

Item.	Reproduction cost, $.	Date of const.	Est'd life, in years.	Int. rate, %.	Annual depreciation. Percent.	Annual depreciation. Amount, $.	Total depreciation. Age, years.	Total depreciation. Factor, %.	Total depreciation. Amount, $.	Net physical value.
1. Preliminary Cost	$14,455	....	..	..	.....	...	..	....	....	$14,455
2. (*a*) Real Estate	17,860	....	..	..	.....	...	..	....	....	17,860
(*b*) Rights-of-Way	5,102	....	..	..	.....	...	..	....	....	5,102
(*c*) Buildings and Improvements	11,002	....	..	..	.....	...	..	....	....	11,002
Totals	$48,419	....	..	..	.....	...	..	....	....	$48,419
The Water Supply.										
3. The Gravity Springs	$14,645	1908	75	4	.214	$92	7	1.76	$759	$13,886
Water Rights	40,000	....	..	..	.....	...	..	....	....	40,000
4. The Ada Springs	19,231	1910	75	4	.214	121	5	1.2	673	18,558
Water Rights	6,683	....	..	..	.....	...	..	....	....	6,683
6. Beaver Pond Spring—No. 23.	137	1899	25	4	2.31	3	16	52.4	72	65
Water Rights	2,317	....	..	..	.....	...	..	....	....	2,317
8. Pipe line from Gravity Springs to City	22,467	1908	75	4	.214	48	7	1.76	395	22,072
9. Pipe line from Ada Springs to City	54,487	1908	75	4	.214	117	7	1.76	959	53,528

10. Pipe line from Beaver Pond to City	4,173	1892	75	4	.214	9	23	8.2	342	3,831
Totals—Water Supply	$165,140	....	..	..	.....	$390	..	....	$3,200	$161,940
Carry forward—Totals	$213,559	....	..	..	.....	$390	..	....	$3,200	$210,359

Brought forward—Totals	$213,559	....	..	..	.....	$390	..	....	$3,200	$210,359
11. The Ada Station Building	15,062	1906	50	4	.63	95	9	6.9	1,039	14,013
12. Steel Stack	2,391	1906	30	4	1.71	50	9	18.9	554	2,377
13. Coal Chute	868	1906	50	4	.63	5	9	6.9	60	808
14. Oil House	168	1906	50	4	.63	1	9	6.9	12	156
15. The Worthington Pump	1,439	1900	20	4	3.23	46	15	67.2	967	472
16. The Snow Pump	16,645	1906	40	4	1.012	168	9	11.2	1,864	14,781
17. Auxiliaries	1,049	1906	30	4	1.71	18	9	18.9	198	851
18. Boiler Plant	6,444	1906	25	4	2.31	149	9	25.4	1,637	4,807
19. All piping in Station	1,639	1905	30	4	1.71	28	9	18.9	310	1,329
20. Piping in Station Yard	1,348	1906	50	4	.63	8	10	7.9	107	1,241
21. Concrete Retaining Wall	1,295	1907	50	4	.63	8	8	6.03	78	1,217
22. Station Yard Improvements	3,916	1907	50	4	.63	25	8	6.03	236	3,680
23. Station Miscellaneous	1,400	1904	25	4	2.31	32	11	32.4	454	946
24. Beaver Pond Station Building	984	1911	15	4	4.8	47	4	21.8	214	770
25. Steel Stack and Breeching	260	1911	15	4	4.8	12	4	21.8	57	203
26. Worthington Pump	801	1892	35	4	1.31	10	23	49.8	399	402
27. Feed Water Heater	93	1892	35	4	1.31	1	23	49.8	46	47
28. Boiler Plant	2,986	1899	25	4	2.31	69	16	52.4	1,565	1,421
29. All Piping in Station	410	1900	30	4	1.714	7	15	35.7	146	264
30. Intake and Pipe Line to Pumping Station	238	1892	50	4	.63	2	23	24.0	57	181
31. Station Miscellaneous	22	1900	30	4	1.714	1	15	35.7	8	14
Total—Pumping Station	$59,988	....	..	..	.....	$782	..	....	$10,008	$49,980
Carry forward—Totals	$273,547	....	..	..	.....	$1,172	..	...	$13,208	$260,339

Item.	Reproduction cost, $.	Date of const.	Est'd life, in years.	Int. rate, %.	Annual depreciation. Percent.	Annual depreciation. Amount, $.	Total depreciation. Age, years.	Total depreciation. Factor, %.	Total depreciation. Amount, $.	Net physical value.
Brought forward—Totals....	$273,547	....	..	..	.....	$1,172	..	....	$13,208	$260,339
				The Distribution System.						
32. Cast Iron Street Mains.....	43,989	1903	92	4	.107	47	12	1.67	735	43,254
33. Cast Iron Specials on Street Mains	1,927	1903	92	4	.107	2	12	1.67	32	1,895
34. Laying Cast Iron Street Mains	19,579	1903	92	4	.107	21	12	1.67	327	19,252
35. Galvanized Iron Street Mains	7,676	1903	30	4	1.71	131	12	26.8	2,057	5,619
36. Laying G. I. Street Mains...	7,907	1903	30	4	1.71	135	12	26.8	2,119	5,788
37. Extra for Unusual Excavation	10,263	1903	92	4	.107	11	12	1.67	171	10,092
38. Steam Railroad Crossings...	1,415	1903	92	4	.107	1	12	1.67	24	1,391
39. (*a*) Street Ry. Crossings over C. I. mains.....	356	1903	92	4	.107	1	12	1.67	6	350
(*b*) Street Ry. Crossings over G. I. Mains.....	82	1903	30	4	1.71	1	12	26.8	22	60
40. (*a*) Cutting Pavements over C. I. mains.....	26,846	1903	92	4	.107	29	12	1.67	448	26,398
(*b*) Cutting Pavements over G. I. Mains.....	1,839	1903	30	4	1.71	31	12	26.8	493	1,346
41. Valves on Mains.....	3,138	1903	50	4	.63	20	12	9.8	308	2,830
42. Valve Boxes on Mains.....	546	1903	50	4	.63	3	12	9.8	54	492
43. Fire Hydrants.....	435	1903	50	4	.63	3	12	9.8	43	392
44. Services—Unusual Excavation Cutting Pavement....	24,395	1903	50	4	.63	154	12	9.8	2,391	22,004
45. Meters in Service.....	14,292	....	..	..	.....	462	..	....	3,573	10,719
Carry forward.....	$164,685	....	..	..	.....	$1,052	..	....	$12,803	$151,882

Brought forward.....	$164,685	....	..	..	.....	$1,052	..	....	$12,803	$151,882
46. Meter Boxes and Vaults.....	7,547	1903	50	4	.63	48	12	9.8	740	6,807
47. Twin Tanks.....	33,506	1906	30	4	1.71	573	9	18.9	6,333	27,173
48. Bland Street Tank.....	6,944	1892	30	4	1.71	119	23	65.3	4,534	2,410
49. Electric Transmission Line..	653	1913	25	4	2.31	15	2	4.9	32	621
Totals—Distribution System	$213,335	....	..	..	.....	$1,807	..	....	$24,442	$188,893
Miscellaneous.										
50. Laboratory Equipment.....	$250	....	..	..	.....	...	..	....	....	$250
51. Office Furnishings.....	1,100	....	..	..	.....	...	..	....	....	1,100
52. Materials and Supplies.....	8,100	....	..	..	.....	...	..	....	....	8,100
53. Engineering & Superintending	22,395	....	..	..	.....	$150	..	....	$1,880	20,515
54. Administrative & Legal Costs.	8,960	....	..	..	.....	60	..	....	755	8,205
55. General Contingent Costs...	17,920	....	..	..	.....	120	..	....	1,505	16,415
56. Interest During Construction.	16,368	....	..	..	.....	99	..	....	1,254	15,114
Totals—Miscellaneous....	$75,093	....	..	..	.....	$429	..	....	$5,394	$69,699
Total Value—Physical Plant	$561,975	....	..	..	.....	$3,408	..	....	$43,044	518,931
57. Going Concern Value.....	16,328	....	..	..	.....	...	..	....	....	16,328
Total Cost of Reproduction	$578,303	....	..	..	.....	$3,408	..	....	$43,044	$535,259
58. Operating Capital.....	.....	....	..	..	.....	...	..	....	....	5,000
Total Reproduction Value Including Operating Capital										$540,259

686½ *Preliminary Costs.*

Real Estate and Easements.

687 Item No. 1. Preliminary Cost.

Includes all costs preliminary to the development of a precise plan of construction, such as:

(*a*) Business investigations and negotiations.
(*b*) Expert preliminary engineering reports.
(*c*) Legal Advice.
(*d*) Special engineering investigations for source of water supply.
(*e*) Optioning Real Estate (Cost of).
(*f*) Organization of Company.
(*g*) Acquisition of Franchise.
(*h*) And, in general, all costs such as are incidental to the proper placing of the interprise upon a definite basis up to the point where detailed plans may be prepared and actual construction begun.

This item is taken at 3% of the reproduction cost of Items Nos. 2 to 52 inclusive, amounting to.....$14,455.00

Item No. 2. Real Estate and Rights-of-Way.

Real estate appraised by Donohue & Easley, prominent real estate men of Bluefield. The values determined by these men have been adopted for use in this report.

(*a*) Real Estate.

The grant of spring tract includes the right-of-way for the pipe lines through the owner's farm.

Gravity Springs:

No. 1—11/21/'87—Estill Bailey & Wife, Jos. I. Doran, 0.5 acre @.....	$25.00
No. 2— 9/28/'87—John T. Bailey & wife, Jos. I. Doran, 0.5 acre @.....	25.00
Carry forward.....	$50.00

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Brought forward.....	$50.00
No. 3— 7/23/'90—John T. Bailey, Jos. I. Doran & J. H. Dingee 0.5 acre @.....	15.00
No. 3— 2/21/'11—John T. Bailey & Wife, B. W. W. & I. Co., 1.128 A. @.....	35.00
No. 4— 7/23/'90—John T. Bailey, Jos. I. Doran & J. H. Dingee, 0.5 acre @.....	13.00

No. 4— 2/21/'11—John T. Bailey & Wife, B. W. W. & I. Co., 1.750 A. @.....	47.00
No. 5— 7/17/'90—A. W. Bailey & Wife, Jos. I. Doran & J. H. Dingee, 0.5 acre @.....	25.00
No. 6— 7/17/'90— A. J. Bailey & Wife, Jos. I. Doran & J. H. Dingee, 0.5 acre @.....	13.00
No. 6— 7/31/'06—C. A. Bailey & Wife, B. W. W. & I. Co., 1.91 A. @.....	47.00
No. 6— 5/20/'08—C. A. Bailey & Wife, B. W. W. & I. Co., 2.50 A. @.....	65.00
No. 7 & 8—5/20/'08—C. A. Bailey et ux., et al., B. W. W. & I. Co., 1.50 A. @.....	50.00
No. 9— 6/ 4/'08—Robt. W. Tuggle & Wife, B. W. W. I. Co., 1.17 A. @.....	25.00
No. 10—6/ 4/'08—Robt. W. Tuggle & Wife, B. W. W. & I. Co., 0.30 A. @.....	25.00
No. 11—6/ 4/'08—Robt. W. Tuggle & Wife, B. W. W. & I. C., 0.35 A. @.....	25.00
Ada Springs:	
No. 12—12/13/'10—Thos. P. Morgan & Wife, B. W. W. & I. Co., 0.35 A. @.....	25.00
No. 13—12/13/'10—Thos. P. Morgan & Wife, B. W. W. & I. Co., 0.37 A. @.....	25.00
No. 14—12/13/'10—Thos. P. Morgan & Wife, B. W. W. & I. Co., 0.51 A. @.....	25.00
No. 15— 6/ 7/'09—R. H. Bailey & Wife, B. W. W. & I. Co., 236.25 A. @.....	5,000.00
No. 16— 7/22/'09—R. H. Bailey & Wife, B. W. W. & I. Co., 1.06 A. @.....	25.00
No. 17— 7/22/'10—Ballard P. Wilson & Wife, B. W. W. & I. Co., 1.99 A. @.....	50.00
No. 18— 7/22/'10—Walter T. Bailey & Wife, B. W. W. & I. Co., 41.88 A. @.....	975.00
Carry forward.....	$6,560.00
689	
Brought forward.....	$6,560.00
No. 18—12/24/'10—Walter . Bailey & Wife, B. W. W. & I. Co., 1.11 A. @.....	25.00
No. 20—10/14/'05—W. H. Thompson & Wife, B. W. W. & I. Co., .0578 A. @.....	25.00
No. 21—12/20/'00—W. H. Thompson & Wife, B. W. W. & I. Co., 2.00 A. @.....	100.00
No. 22—10/ 1/'07—Estill Bailey & Wife, B. W. W. & I. Co., 0.46 A. @.....	25.00
Jarrell Spring:	
No. 19—10/14/'05—Mariha S. Jarrell, et al., B. W. W. & I. Co., 1.00 A. @.....	25.00

Beaver Pond Spring:

No. 23—5/5/'92—Carmack Bailey, et al., B. W. W. & I. Co., 1.00 A. @ 500.00

Twin Tanks:

1/22/'97—H. M. Nash, et al., B. W. W. & I. C., 15.25 A 2,000.00

Bland Street Tank:

Lot 5—Sec. 88—Bluefield 500.00

Office:

Lot 1—Sec. 22—Bluefield 5,000.00

Ada Pumping Station:

7/27/'00—Estill Bailey & Wife, B. W. W. & I. Co., 0.50 A 30.00
10/ 1/'07—Estill Bailey & Wife, B. W. W. & I. Co., 1.12 A 70.00

Honaker Mill Reservoir and Dam:

10/1/'07—Estill Bailey & Wife, B. W. W. & I. Co., 99.36 A 2,500.00

Ruble Farm:

1/18/'08—H. C. Ruble & Wife, B. W. W. & I. Co. 46.50 A 500.00

$17,860.00

Total Present Worth (*a*) $17,860.00

690 (*b*) Rights-of-Way.

Beaver Pond and Gravity Spring Lines:

9/28/'87—Nancy Williams to Jos. I. Doran	$25.00
" —Catherine Davidson to Jos. I. Doran	25.00
" —Eliza Bailey to Jos. I. Doran	25.00
8/14/'90—Mary E. Hale to Jos. I. Doran & J. H. Dingee	45.00
" —Catherine Davidson to " " "	45.00
3/10/92—E. J. Bailey & Wife to B. W. W. & I. Co...	30.00
3/15/'92—Eliza Bailey " "	25.00
" —H. B. Bailey & Wife " "	100.00
" —Jas. R. Calfee & " " "	65.00
" —Jno. P. Williams et al. to "	225.00
" —T. M. Calfee et al. to "	40.00

Ada Spring Lines:

2/28/00—Boyd S. Belcher & Wife to B. W. W. & I. Co	400.00
" —Jas. Hearn " " " "	100.00
" —Mary E. Roland & Husband to "	100.00
7/13/00—R. M. Calfee " "	50.00
" —Jas. Hearn & Wife " "	1.00
" —E. J. Bailey & Wife " "	100.00
7/13/00—Geo. P. Bailey & wife " "	100.00
" —Eliza P. " " " " "	100.00
7/27/00—Estill Bailey " " " "	25.00
7/30/00—J. W. Caldwell " " " "	25.00
8/6/00—G. B. Higgenbottom et al. " "	1.00
8/16/00—Rebecca Bailey " "	75.00
10/21/09—Lucy J. Taylor " "	50.00
7/22/10—Jno. W. Wilson & wife " "	150.00
8/4/10—A. B. Helton " " " "	75.00

Jarrell Spring Line:

2/28/00—Jno. Eagle to B. W. W. & I. Co.....	100.00
12/6/09—C. W. Mills et al. to B. W. W. & I. Co.....	200.00
Construction of spring, pipe lines, concrete houses and water troughs for former owners of spring tracts, as consideration for permission to build and maintain springs and lines.....	2,800.00
Total (*b*)	$5,102.00

691 (*c*) Buildings and Improvements.

At Beaver Pond Springs:

One three room and enclosed porch one story, frame cottage, built about 1892 on stone foundation.
Area main floor = 708 sq. ft.
Cubical contents, outside dimensions from bottom of foundation to average height of roof = 11,376 cu. ft.
House is well painted and in good condition.

Present worth $400.00

At Ada Pumping Station:

One three room, one story frame cottage built about 1902 on wooden posts. It is unpainted and in poor repair.
Area of main floor = 457 sq. ft.
Cubic contents, outside dimensions from top of foundation to average height of roof = 6,250 cu. ft.

Present worth..... 350.00

At Spring No. 6:

Frame tool house, built of rough lumber about 1911. It is unpainted, in poor repair, and is not used at present.

Area of floor = 151 sq. ft.

Cubic contents, outside dimensions from bottom of sills to average height of roof = 1,238 cu. ft.

Present worth 25.00

Carry forward $775.00

692 Brought forward $775.00

At Spring No. 15 (Henry Bailey Farm):

This farm is in good order. It has a young orchard of about 40 trees, a 2 story house, barn, and a spring house.

The farm house is an 8 room, two story frame structure on masonry piers, built about 1900. The house is painted and in good repair.

Area of main floor = -,680 sq. ft.

Cubic contents, outside dimensions, from top of piers to average height of roof = 13,300 cu. ft.

Present worth 2,000.00

The barn and crib is built of rough lumber, and the cubical contents, outside dimensions from bottom of sills to average height of roof = 10,640 cu. ft.

Present worth 300.00

The spring house is of rough frame construction, whose cubical contents = 410 cu. ft.

Present worth 35.00

The fence includes the following quantities:

4,450 lin. ft. rail fence	@	$.05..	$222.50
7,200 " woven fence with 1 strand barb wire on top	@	.05..	360.00
720-locust fence posts 8′ long	@	.65..	468.00
			1,050.50

Carry forward $4,160.50

693 Brought forward $4,160.50

At Spring No. 2. (Ada Spring):

A small farm house and outbuildings are located near this spring. Built about 1902.

The farm house is a four room, one story unpainted frame structure, whose cubical contents, outside dimensions = 7,100 cu. ft.

Present worth 450.00

The barn is a rough frame structure, whose cubical contents, outside dimensions = 2,170 cu. ft.

Present worth 75.00

The spring house is a frame building covered with 1" sheathing and weatherboard, and with 1" pine floor. The cubical contents, outside dimensions = 425 cu. ft.

Present worth 25.00

The dairy or root house is a frame house containing 200 ft. B. M. of lumber, covered with earth, and whose cubical contents = 186 cu. ft.

Present worth 20.00

The tool house is a rough frame building whose cubic contents, outside dimensions = 840 cu. ft.

Present worth 40.00

Carry forward $4,770.50

694 Brought forward $4,770.50

The board walks contain 400 ft. B. M.

Present worth 20.00

The fences contain the following quantities:

5,100 ft. B. M. solid board fences	@	$50.00	$255.00	
1,750 lin. ft. of barb wire.....	@	.01	17.50	
55 small posts, 8' long.....	@	.25	13.75	
				286.25

At Ruble Farm (Jarrell Spring):

The farm house is a 5 room, one story frame building on cut stone foundation and with cut stone chimney. The house is unpainted and the chimney and foundation contains 550 cu. ft. of cut stone. The cubic contents, outside dimensions = 8,100 cu. ft.

Present worth 600.00

Not in total.*

The tool house is an unpainted, rough frame building, with clap board roof.

Present worth 25.00

*In pencil in copy.

Office Building:

Built in 1912 with concrete foundation and outside walls of brick veneer, set against building paper on 1″ sheathing. The roof is 1″ sheathing covered with galvanized shingles and contains 4 dormer windows.

Carry forward $5,701.75

695 Brought forward $5,701.75

The basement has a concrete floor and is subdivided by board and plaster walls. The main floor is plastered throughout and the attic is unfinished except for a rough floor.

All basement windows are barred. The main floor trim is first quality pine, painted with white enamel. The doors and windows are fitted with brushed brass fixtures.

Two iron safes are built into the wall and a vault 19′ 0″ x 9′ 6″ in plan built of concrete and brick fitted with iron doors set in the middle of the building.

The entire building is electric lighted and is heated with a hot water heating system. Two toilets and a sink are in the basement and there is a sink and lavatory on the main floor.

A speaking tube system is enclosed between the walls. The lot was graded before the building was erected. Total grading 420 cu. yds.

Main floor area = 1,282 sq. ft.

Cubic contents, outside dimensions basement floor level to average height of roof = 50,310 cu. ft.

Present worth 4,500.00

Carry forward $10,201.75

696 Brought forward $10,201.75

The Garage:

The garage is a brick building built in connection with the office building. The foundation is of concrete with outside walls 8″ thick. The roof is of tine on 1″ sheathing and is supported from the side walls. The center beam is trussed with two rods and turnbuckles. A 6″ x 6″ galvanized iron sky light is placed over the room used as a blacksmith shop. The floor of the vestibule and truck room is of concrete, the latter containing a concrete pit 3′ 0″ x 7′ 0″ x 4′ 6″ (inside dimensions), with a loose board cover made of 2″ x 8″ lumber. Interior partition walls and ceilings are covered with pressed galvanized iron. All windows are barred.

Total floor area = 580 sq. ft.
Cubic contents, outside dimensions, from bottom of footings to top of walls = 9,200 cu. ft.

Present worth	800.00
Total Present Worth (*c*)	$11,001.75

Summary Item No. 2.

(*a*) Real Estate	$17,860.00
(*b*) Rights-of-Way	5,102.00
(*c*) Buildings & Improvements	11,001.75
Total present worth item No. 2	$33,963.75

Item No. 3. The Gravity Springs.

(*a*) Spring No. 1.

(1) Land Improvements:			
Clearing ½ acre of brush and deadwood	@	$100.00	$50.00
100 cu. yds. earth and loose rock excavation in leveling up land	@	.50	50.00
36½ rods woven wire fence	@	.60	21.90
600 lin. ft. barb wire	@	.00¾	4.50
60 fence posts 8′ long, chestnut	@	.30	18.00
(2) Infiltration Lines:			
20 lin. ft. 6″ vit. tile in 4′ rock trench	@	2.25	45.00
20 " " 4″ " " " " " "	@	2.25	45.00
13 cu. yds. blasted stone hammered to small bits	@	1.00	13.00
(3) Head House:			
Area of floor = 22½ sq. ft.			
Cubic contents, outside dimensions, from top of concrete to average height of roof = 174 cu. ft.			
4 cu. yds. of rock excavation	@	4.00	16.00
1.7 cu. yds. concrete in basin	@	20.00	34.00
1 frame superstructure bolted to concrete. Framework 2″ x 4″ pine covered with 1″ rough sheathing and pine weatherboarding with trim. Roof, painted and dipped shingles, on 1″ sheathing. One door made of 2 layers of 1″ pine, tongue and groove lumber, and fitted with 3 strap hinges and padlock. Building painted 2 coats outside	@	$35.00	35.00
Carry forward			$297.40

698 Brought forward				$297.40	
1 iron screen over outlet box 8″ x 16″	@	.75		.75	
(4) Piping in Head House:					
Blow-off (Ave. depth 2′):					
9′ 0″—4″ C. I. pipe, H. & S.	@	.50		4.25	
9′ 0″—4″ vitrified tile	@	.25		2.25	
1 —4″ gate valve, set	@	8.65		8.65	
					$348.55

(b) Spring No. 2.

(1) Land Improvements:				
Clearing ½ A. of brush and deadwood	@	100.00	50.00	
100 cu. yds. of earth fill (ave. 300 ft. wheelbarrow haul)	@	.75	75.00	
39 rods woven wire fence	@	.60	23.40	
636 lin. ft. barb wire fence	@	.00¾	4.77	
64 fence posts 8′ long, chestnut	@	.30	19.20	
(2) Infiltration Lines:				
90 lin. ft. 4″ vitrified tile in 4′ trench (½ clay and ½ boulders)	@	1.00	90.00	
20 cu. yds. boulders hammered to small pieces	@	1.00	20.00	

(3) Head House:

Area of floor = 21 sq. ft.

Cubic contents, from top of concrete basin to average height of roof, outside dimensions = 167 cu. ft.

The Water Supply.—Continued.

4¾ cu. yds. of earth excavation	@	.50	2.37	
2 " " " concrete in basin	@	20.00	40.00	
1—8" x 16" iron screen over outlet box	@	.75	.75	
1—Frame superstructure	@	35.00	35.00	
			$360.49	$348.55
Carry forward				$348.55
699 Brought forward			$360.49	
Brought forward				

(4) Piping in Head House:

Blow-off (Ave. depth 2 ft.):

5′ 6"—4" C. I. pipe, H. & S.	@	.50	2.75	
10′ 0"—4" vitrified tile	@	.25	2.50	
1 —4" gate valve, set	@	8.65	8.65	
				374.39

(c) Spring No. 3.

(1) Land Improvements:

Clearing 1.628 A. of brush and deadwood	@	100.00	162.80	
75 cu. yds. of grading around head house	@	.50	37.50	
115 rods woven wire fence	@	.60	69.00	
190 fence posts, 8′ long, chestnut	@	.30	57.00	

(2) Infiltration Lines:

10 lin. ft. 6″ vitrified tile in 4′ trench (2/3 solid rock)	@	1.50	15.00	
1,035 lin. ft. 4″ vitrified tile in 4′ trench (2/3 solid rock)	@	1.50	1,552.50	
234 cu. yds. of boulders hammered to small pieces	@	1.00	234.00	

(3) Head House:

Area of floor = 18.6 sq. ft.
Cubical contents, outside dimensions, from top of concrete basin to average height of roof = 153 cu. ft.

4¾ cu. yds. of earth excavation	@	.50	2.37	
2 " concrete in basin	@	20.00	40.00	
1—8″ x 18″ iron screen over outlet box	@	.75	.75	
1—frame superstructure	@	30.00	30.00	

(4) Piping in Head House:

Blow-off (Ave. depth 2′ 0″):

4′ 0″—4″ C. I. pipe, H. & S.	@	.50	2.00	
8′ 0″—4″ vitrified tile	@	.25	2.00	
1 —4″ gate valve, set	@	8.65	8.65	
				2,213.57

Carry forward $2,936.51

The Water Supply.—Continued.

700	Brought forward			$2,936.51

(*d*) Spring No. 4.

(1) Land Improvement:

Clearing 2.26 A. of deadwood and brush	@	100.00	$226.00
55 cu. yds. of grading around head houses	@	.50	27.50
118 rods woven wire fence	@	.60	70.80
196 fence posts 8′ long, chestnut	@	.30	58.80

Lower Spring (No. 4 A).

(1) Infiltration Lines:

10′ 0″—6″ vitrified tile in 4′ trench (½ rock)	@	1.00	10.00
325′—4″ vitrified tile in 4′ trench (½ rock)	@	1.00	325.00
75 cu. yds. rock hammered into small bits	@	1.00	75.00

(2) Head House:

Area of floor=21 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of *toof*=126 cu. ft.

4 cu. yds. of earth excavation	@	.50	2.00
1.8 " concrete in basin	@	20.00	36.00
1 8″ x 18″ iron screen over outlet box	@	.75	.75
1 frame superstructure	@	30.00	30.00

(3) Piping in Head House:

Blow-off (Ave. depth 1½ feet):

4′ 0″—4″ C. I. pipe, H. & S.	@	.50	2.00	
5′ 0″—4″ vitrified tile	@	.25	1.25	
1 4″ gate valve, set	@	8.65	8.65	

Upper Spring (No. 4 B).

(1) Infiltration Lines:

10′ 0″—6″ vitrified tile in 4′ trench (⅔ rock)	@	1.50	15.00	
625′—4″ vitrified tile in 4′ trench (⅔ rock)	@	1.50	937.50	
140 cu. yds. rock hammered into small pieces	@	1.00	140.00	
Carry forward			$1,966.25	$2,936.51

Brought forward				$2,936.51
Brought forward			$1,966.25	

(2) Head House:

Area of floor=19 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof=113 cu. ft.

3 cu. yds. of earth excavation	@	.50	1.50	
17 " " concrete in basin	@	20.00	34.00	
1 8″ x 17″ iron screen over outlet box	@	.75	.75	
1 strainer over overflow	@	.35	.35	
1 frame superstructure	@	25.00	25.00	

The Water Supply.—Continued.

(3) Piping in Head House:				
Overflow (Ave. depth 2′ 0″):				
48′ 0″—4″ vitrified tile in 2′ trench	@	.25	12.00	
Blow-off (Ave. depth 2′ 0″):				
6′ 0″—4″ C. I. pipe, H. & S.	@	.50	3.00	
6′ 0″—4″ vitrified tile	@@	.25	1.50	
1—4″ gate valve, set	@	8.65	8.65	
				2,053.00
(*e*) Spring No. 5.				
(1) Land Improvements:				
Clearing ½ A. dead timber and brush	@	100.00	50.00	
20 cu. yds. grading at head house	@@	.50	10.00	
36½ rods woven wire fence	@@	.60	21.90	
60 fence posts 8′ long, chestnut	@	.30	18.00	
(2) Infiltration Lines:				
10′ 0″—6″ vitrified tile in 4′ trench (½ rock)	@	1.00	10.00	
175′ 0″—4″ vitrified tile in 4′ trench (½ rock)	@@	1.00	175.00	
41 cu. yds. of rock hammered into small pieces	@	1.00	41.00	
Carry forward			$325.90	$4,989.51

702	Brought forward				$4,989.51
	Brought forward			$325.90	
	(3) Head House:				
	Area of floor=13.5 sq. ft.				
	Cubic contents, outside dimensions from top of concrete basin to average height of roof=82 cu. ft.				
	2.5 cu. yds. of earth excavation	@	$.50	1.25	
	1.4 " " concrete in basin	@	20.00	28.00	
	1 8" x 15" iron screen over outlet box	@	.75	.75	
	1 frame superstructure	@	20.00	20.00	
	(4) Piping in Head House:				
	Blow-Off (Ave. depth 2' 0"):				
	4' 0"—4" C. I. pipe, H. & S.	@	.50	2.00	
	4' 0"—4" vitrified tile	@	.25	1.00	
	1 4" gate valve, set	@	8.65	8.65	
					387.55
	(*f*) Spring No. 6.				
	Clearing 4.91 A. of deadwood and brush	@	100.00	491.00	
	200 cu. yds. of grading	@	.50	100.00	
	158 rods woven wire fence	@	.60	94.80	
	260 fence posts, 8 ft. long, chestnut	@	.30	78.00	

The Water Supply.—Continued.

Upper Spring (No. 6 A):

(1) Infiltration Lines:

Little shooting required although trenches were full of boulders.

327′ 0″—6″ vitrified tile in 5′ trench	@	1.00	327.00	
2203′ 0″—4″ " " " 5′ "	@	1.00	2,203.00	
562 cu. yds. boulders hammered into small pieces	@	1.00	562.00	

(2) Head House:

Area of floor 29 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof=200 cu. ft.

Carry forward			$3,855.80	$5,377.06
703 Brought forward				$5,377.06
Brought forward			$3,855.80	
7½ cu. yds. of earth excavation	@	$.50	3.75	
3 " " concrete in basin	@	20.00	60.00	
1—7″ x 20″ iron screen outlet box	@	.75	.75	
1—strainer over overflow	@	.35	.35	
1—frame superstructure	@	40.00	40.00	

(3) Piping in Head House:

Blow-off (Ave. depth 2′ 0″):

4′ 6″—6″ C. I. pipe, H. & S.	@	.65	2.93
30′ 0″—6″ vitrified tile	@	.30	9.00
1—6″ gate valve, set	@	13.60	13.60

Overflow (Ave. depth 1′ 0″):

13′ 0″—6″ vitrified tile	@	.20	2.60

Lower Spring (No. 6 B):

(1) Infiltration Lines:

325′ 0″—6″ vit. tile in 6′ trench	@	.35	113.75
595′ 0″—4″ " " " 4′ "	@	.25	148.75
220 cu. yds. boulders hammered to small pieces	@	1.00	220.00

(2) Head House:

Area of floor = 18 sq. ft.

Cubic contents, outside dimensions, from top of concrete basin to average height of roof = 109 cu. ft.

5 cu. yds. earth exacavation	@	.50	2.50
2.3 " concrete in basin	@	20.00	46.00
1—8″ x 20″ iron screen over outlet	@	.75	.75
1—strainer over overflow	@	.35	.35
1—frame superstructure	@	20.00	20.00

The Water Supply.—Continued.

(3) Piping in Head House:

Overflow:

3′ 0—6″ vitrified tile	@	.15	.45,	
Carry forward			$4,541.33	$5,377.06
704 Brought forward				$5,377.06
Brought forward			$4,541.33	
Blow-off:				
4′ 6″—4″ C. I. pipe, H. & S.	@	$.40	1.80	
20′ 6″—4″ vitrified tile	@	.10	2.05	
1—4″ gate valve, set	@	8.65	8.65	
(4) Concrete Retaining Wall:				
1 cu. yd. concrete in 10″ wall 2′ high	@	16.00	16.00	
20 cu. yds. boulders hammered to small pieces	@	1.00	20.00	
(5) Tool House:				
Of rough oak and poplar and ½ floored. Area of floor = 155 sq. ft. Cubic contents, outside dimensions, from bottom of sills to average height of roof = 1,240 cu. ft.	@	120.00	120.00	4,709.83

(*g*) Spring No. 7 & 8.

Land Improvements:

Clearing 1.5 A of brush and deadwood	@	100.00	150.00	
94 rods woven wire fence	@	.60	56.40	
155 fence posts 8′ long, chestnut	@	.30	46.50	
East Spring (No. 7 A):				
(1) Infiltration Lines:				
20′—4″ vitrified title 4′ deep (rocky)	@	1.00	20.00	
4½ cu. yds. boulders hammered to small pieces	@	1.00	4.50	
Carry forward			$277.40	$10,086.89
705 Brought forward				$10,086.89
Brought forward			$277.40	
(2) Head House:				
Area of floor = 15 sq. ft.				
Cubic contents, outside dimensions, from top of concrete basin to average height of roof = 90 cu. ft.				
2.5 cu. yds. earth excavation	@	$.50	1.25	
1.6 " concrete in basin	@	20.00	32.00	
1—8″ x 14″ iron screen over outlet box	@	1.00	1.00	
1—strainer over overflow	@	.35	.35	
1—frame superstructure	@	20.00	20.00	

The Water Supply.—Continued.

(3) Piping in Head House:

Blow-off (Ave. depth 1½ft.):			
4′ 0″—4″ C. I. pipe, H. & S.	@	.50	2.00
10′ 0″—4″ vitrified tile	@	.25	2.50
1—4″ gate valve, set	@	8.65	8.65
Overflow:			
7′ 6″—4″ vitrified tile	@	.10	.75

Lower Spring (No. 7 B):

(1) Infiltration Lines:

560′ 0″ vitrified tile in 3′ trench (solid rock)	@	1.75	980.00
83 cu. yds. rock hammered to small pieces	@	1.00	83.00

(2) Head House:

Area of floor = 26 sq. ft.
Cubic contents, outside dimensions from top of concrete basin to average height of roof = 155 cu. ft.

Carry forward	$1,408.90	$10,086.89

706	Brought forward			$10,086.89
	Brought forward		$1,408.90	
4.5 cu. yds. earth excavation	@	$.50	2.25	
2.2 " concrete in basin	@	20.00	44.00	
1—6" x 14" iron screen over outlet box	@	.75	.75	
1—strainer over overflow	@	.35	.35	
1—frame superstructure	@	30.00	30.00	
(3) Piping in Head House:				
Blow-off (Ave. cut 1½ feet):				
4' 0"—4" C. I. pipe, H. & S.	@	.50	2.00	
25' 0"—4" vitrified tile	@	.25	6.25	
1—4" gate valve, set	@	8.65	8.65	
Overflow:				
15' 0"—4" vitrified tile	@	.25	3.75	
West Spring (No. 7 C):				
(1) Infiltration Lines:				
250' 0"—4" vitrified tile in 4' trench (½ solid rock)	@	1.00	250.00	
55 cu. yds. rock hammered into small pieces	@	1.00	55.00	

The Water Supply.—Continued.

(2) Head House:

Area of floor = 15 sq. ft.
Cubic contents, outside dimensions, from top of concrete basin to average height of roof = 89 cu. ft.

3.3 cu. yds. earth excavation	@	.50	1.65	
1.7 " concrete in basin	@	20.00	34.00	
1—10" x 15" iron screen over outlet	@	.75	.75	
1—strainer over overflow	@	.35	.35	
1—frame superstructure	@	20.00	20.00	
Carry forward			$1,868.65	$10,086.89
707 Brought forward				$10,086.89
Brought forward			$1,868.65	

(3) Piping in Head House:

Blow-off (Ave. Depth 2 feet):

45' 6"—4" C. I. pipe, H. & S.	@	.50	22.75	
1—4" gate valve, set	@	8.65	8.65	
Overflow:				
11' 6"—4" vitrified tile	@	.10	1.15	
				1,901.20

(1) Land Improvements: (*h*) Spring No. 9.				
Clearing 1.17 A. of brush and deadwood	@	100.00	117.00	
88 rods of woven wire fence	@	.60	52.80	
145 posts 8′ long, chestnut	@	.30	43.50	
(2) Infiltration Lines:				
750′ 0″—4″ vitrified tile in 4′ trench (solid rock)	@	2.25	1,687.50	
167 cu. yds. rock hammered to small pieces	@	1.00	167.00	
(3) Head house:				
Area of floor = 21 sq. ft.				
Cubic contents, outside dimensions from top of concrete basin to average height of roof = 21 sq. ft.				
5 cu. yds. rock excavation	@	4.50	22.50	
2.6 cu. yds. of concrete in basin	@	20.00	52.00	
1—8″ x 20″ iron screen over outlet	@	.75	.75	
1—strainer	@	.35	.35	
1—frame superstructure	@	25.00	25.00	
				2,168.40
Carry forward				$14,156.49
Brought forward				$14,156.49
(*i*) Spring No. 10.				
(1) Land Improvements:				
Clearing 0.3 A. of brush and deadwood	@	100.00	$30.00	
28 rods woven wire fence	@	.60	16.80	
46 fence posts, 8′ long, chestnut	@	.30	13.80	

The Water Supply.—Continued.

(2) Infiltration Lines:				
30′ 0″—4″ vitrified tile in 3′ trench (½ rock)	@	1.00	30.00	
25′ 0″—4″ " " " 4′ " (earth)	@	.30	7.50	
50′ 0″—4″ " " " 4′ " (rock)	@	2.25	112.50	
19 cu. yds. of rock hammered to small pieces	@	1.00	19.00	
(3) Head House:				
Area of floor = 21 sq. ft.				
Cubic contents, outside dimensions from top of concrete basin to average height of roof = 127 cu. ft.				
5 cu. yds. of earth excavation	@	.50	2.50	
2.6 " concrete in basin	@	20.00	52.00	
1—10″ x 16″ iron screen over outlet box	@	.75	.75	
1—strainer	@	.35	.35	
1—frame superstructure	@	25.00	25.00	
(4) Piping in Head House:				
Blow-off (Ave. depth 2′ 0″):				
5′ 0″—4″ C. I. pipe, H. & S.	@	.50	2.50	
35′ 0″—4″ vitrified tile	@	.25	8.75	
1—4″ gate valve, set	@	8.65	8.65	
Overflow:				
19′ 0″—6″ vitrified tile	@	.20	3.80	
				333.90
Carry forward				$14,490.38

Brought forward			$14,490.38

(j) Spring No. 11.

(1) Land Improvements:

Clearing 0.35 A. of brush & deadwood	@	100.00	$35.00
40½ rods of woven wire fence	@	.60	24.30
67 fence posts, 8′ long, chestnut	@	.30	20.10

(2) Infiltration Lines:

10′ 0″—4″ vitrified tile in 4′ trench (earth)	@	.30	3.00
2 cu. yds. of rock hammered to small pieces	@	1.00	2.00

(3) Head House:

Area of floor = 13½ sq. ft.
Cubic contents, outside dimensions, from top of concrete basin to average height of roof = 72 cu. ft.

4 cu. yds. earth excavation	@	.50	2.00
1.7 " concrete in basin	@	20.00	34.00
1—6″ x 13″ iron screen over outlet box	@	.75	.75
1—frame superstructure	@	15.00	15.00

(4) Piping in Head House:

Blow-off (Ave. depth 2′ 0″):

13′ 6″—4″ C. I. pipe, H. & S.	@	.50	6.75
1—4″ gate valve, set	@	8.65	8.65

The Water Supply.—Continued.

Overflow:				
7′ 0″—4″ C. I. pipe, H. & S.	@	.40	2.80	154.35
Total Item No. 3				$14,644.73
Depreciation:				
Ave. age 7 yrs. Ave. life 50 yrs. Int. rate 4%. Annual Depreciation @ .63% = $92.26				
Accrued Depreciation @ 5.18%				758.60
Net physical value				$13,886.13
Present Worth of Water Rights in Connection with above group of springs				$40,000.00

710

Item No. 4. The Ada Springs.

(*a*) Spring No. 12.

(1) Land Improvements:			
Clearing 0.354 A. of brush & deadwood	@	100.00	$35.40
33 rods woven wire fence	@	.60	19.80
54 fence posts 8′ long, chestnut	@	.30	16.20
300 cu. yds. grading	@	.50	150.00
(2) Infiltration Lines:			
130′ 0″—4″ tile in 10′ trench (½ large rock)	@	1.00	130.00
85′ 0″—4″ tile in 6′ trench (½ large rock)	@	.60	51.00
153′ 0″—4″ tile in 6′ trench (½ large rock)	@	.60	91.80
82 cu. yds. stone hammered to small pieces	@	1.00	82.00

(3) Head House:

Area of floor = 23 sq. ft.
Cubic contents, outside dimensions, from top of concrete basin to average height of roof = 144 cu. ft.

8 cu. yds. of earth excavation	@	.50	4.00	
3.2 " " concrete in basin	@	20.00	64.00	
1 6" x 20" iron strainer over outlet box	@	.75	.75	
1 frame superstructure	@	30.00	30.00	

(4) Piping in Head House:

Blow-off (Ave. depth 2 feet):

4' 6"—6" C. I. pipe, H. & S.	@	.65	2.93	
8' 0"—6" vitrified tile	@	.30	2.40	
1—6" gate valve, set	@	13.60	13.60	

Overflow:

12' 0"—4" vitrified tile	@	.10	1.20	
				$695.08
Carry forward				$695.08
711 Brought forward				$695.08

The Water Supply.—Continued.

(*b*) Spring No. 13.

(1) Land Improvements:

Clearing 0.372 A. of brush & deadwood	@	100.00	$37.20
31½ rods woven wire fence	@	.60	18.90
52 fence posts 8′ long, chestnut	@	.30	15.60
600 cu. yds. grading (leveling up)	@	.40	240.00
45 " " excavation in 300′ ditch	@	.50	22.50

(2) Infiltration Lines:

200′ 0″—4″ tile in 5′ trench (loose rock and earth)	@	.35	70.00
45 cu. yds. stone hammered into small pieces	@	1.00	45.00

(3) Head House:

Area of floor = 23 sq. ft.

Cubic contents, outside dimensions from top of concrete basin to average height of roof = 150 cu. ft.

6.5 cu. yds. earth excavation	@	.50	3.25
3.3 " " concrete in basin	@	20.00	66.00
1—5″ x 20″ iron screen over outlet box	@	.75	.75
1—frame superstructure	@	30.00	30.00

(4) Piping in Head House:

Blow-off:

3′ 6″—4″ C. I. pipe, H. & S.	@	.40	1.40
30′ 0″—4″ vitrified tile	@	.10	3.00
1—4″ gate valve, set	@	8.65	8.65

	Overflow:				
	7′ 0″—4″ vitrified tile	@	.10	.70	
	Carry forward				562.95
					$1,258.03
712	Brought forward				$1,258.03
	(*c*) Spring No. 14.				
	(1) Land Improvements:				
	Clearing 0.509 A. of brush & deadwood	@	100.00	50.90	
	65 rods woven wire fence	@	.60	39.00	
	110 fence posts, 8′ long, chestnut	@	.30	33.00	
	1,500 cu. yds. grading around head house	@	.40	600.00	
	600 " " " at road	@	.40	240.00	
	(2) Infiltration Lines:				
	93′ 0″—4″vitrified tile, 5′ trench (earth and boulders)	@	.60	55.80	
	95′ 0″—4″ vitrified tile, 5′ trench (rock)	@	2.25	213.75	
	330′ 0″—3″ C. I. pipe, H. & S.	@	.40	132.00	
	42 cu. yds. stone hammered to small pieces	@	1.00	42.00	
	(3) Head House:				
	Area of floor = 25 sq. ft.				
	Cubic contents, outside dimensions, from top of concrete basin to average height of roof = 176 cu. ft.				
	11 cu. yds. excavation (earth)	@	.50	5.50	
	3½ " concrete in basin	@	20.00	70.00	
	1—5″ x 20″ iron screen over outlet box	@	.75	.75	
	1—frame superstructure	@	35.00	35.00	

The Water Supply.—Continued.

(4) Piping in Head House:

Blow-off (Ave. depth 2 ft.):

9′ 0″—4″ C. I. pipe, H. & S.	@	.50	4.50	
1—4″ gate valve, set	@	8.65	8.65	
Overflow:				
9′0″—4″ vitrified tile	@	.10	.90	1,531.75
Carry forward				$2,789.78
713 Brought forward				$2,789.78

(*d*) Spring No. 15.

24 rods woven wire fence	@	$.60	$14.40	
40 fence posts 8′ long, locust	@	.50	20.00	
85 cu. yds. excavation in 380 lin. ft. of ditch	@	.50	42.50	76.90

(*e*) Spring No. 16.

(1) Land Improvements:

Clearing 1.058 A. of brush & deadwood	@	100.00	105.80	
53½ rods woven wire fence	@	.60	32.10	
88 fence posts 8′ long, chestnut	@	.30	26.40	
20 cu. yds. grading	@	.50	10.00	

(2) Infiltration Lines:

525′ 0″—4″ tile 4′ trench (1/3 rock)	@	.75	393.75	
117 cu. yds. rock hammered to small pieces	@	1.00	117.00	

(3) Head House:

Area of floor = 9 sq. ft.
Cubic contents, outside dimensions, from bottom of foundation to average height of roof = 143 cu. ft.

4 cu. yds. of earth excavation	@	.50	2.00	
2.9 cu. yds. " concrete in basin and walls	@	20.00	58.00	
0.3 " " of reinforced concrete roof slab 4″ thick	@	20.00	6.00	
150 lbs. ¾″ rods	@	.03	4.50	
1 iron door and frame, weight approximately 90 lbs.	@	.04	3.60	
1—5½″ x 14″ iron screen over outlet box	@	.75	.75	
1 hasp and padlock	@	1.00	1.00	

(4) Piping in Head House:

Blow-off:

11′ 6″—4″ C. I. pipe, H. & S.	@	.40	4.60	
1—4″ gate valve, set	@	8.65	8.65	

Overflow:

2′ 0″—4″ vitrified tile	@	.10	.20	
				774.35
Carry forward				$3,641.03

The Water Supply.—Continued.

714	Brought forward			$3,641.03

(*f*) Spring No. 17.

(1) Land Improvements:

Clearing 1.99 A. of brush & deadwood	@	100.00	$199.00
99 rods woven wire fence	@@	.60	59.40
165 fence posts 8′ long, chestnut	@@	.30	49.50
30 cu. yds. of grading	@	.50	15.00

(2) Infiltration Lines:

440′ 0″—4″ vitrified tile in 4′ trench (loose rock)	@	.50	220.00
180′ 0″—4″ C. I. pipe, H. & S. in 4′ trench (loose rock)	@@	.80	144.00
98 cu. yds. rock hammered into small pieces	@	1.00	98.00

(3) Head House:

Area of floor = 8½ sq. ft.
Cubic contents, outside dimensions from bottom of foundation to average height of roof = 147 cu. ft.

4 cu. yds. of earth excavation	@	.50	2.00
2.9 " " " concrete in basin and walls	@@	20.00	58.00
0.5 " " " concrete in reinforced roof slab	@@	20.00	10.00
180 lbs. ¾″ round rods	@@	.03	5.40
1 iron door and frame, approximate weight 90 lbs.	@@	.04	3.60
1—5″ x 18″ iron screen on outlet box	@@	.75	.75
1 Hasp and padlock	@	1.00	1.00

(4) Piping in Head House:

Blow-off (Ave. depth 2 feet):

17′ 0″—4″ C. I. pipe, H. & S.	@	.50	8.50	
1—4″ gate valve, set	@	8.65	8.65	
Overflow:				
4′ 0″—4″ vitrified tile	@	.10	.40	
				883.20
Carry forward				$4,524.23
715 Brought forward				$4,524.23

(*g*) Spring No. 18.

Land Improvements:

Clearing 15 A. of brush & dead wood	@	100.00	$1,500.00
255 rods woven wire fence	@	.60	153.00
420 fence posts 8′ long, chestnut	@	.30	126.00
900 cu. yds. grading	@	.40	360.00

East Spring (No. 18 A).

(1) Infiltration Lines:

125′ 0″—4″ vitrified tile, 5′ trench (rock)	@	2.25	281.25
28 cu. yds. rock hammered into small pieces	@	1.00	28.00

The Water Supply.—Continued.

(2) Head House:

Area of floor 8 sq. ft.
Cubic contents, outside dimensions from bottom of foundation to average height of roof = 131 cu. ft.

2½ cu. yds. earth excavation	@	.50	1.25	
3 " " concrete in basin & walls	@	20.00	60.00	
½ " " " " reinforced roof slab	@	20.00	10.00	
140 lbs. ¾" round rods	@	.03	4.20	
1 iron door and frame, approximate weight = 80 lbs.	@	.04	3.20	
1—6½" x 21" iron screen over outlet box	@	.75	.75	
1—hasp and padlock	@	1.00	1.00	

(3) Piping in Head House:

Blow-off:

12' 0"—4" C. I. Pipe, H. & S.	@	.40	4.80	
1—4" gate valve, set	@	8.65	8.65	

Overflow:

9' 0"—6" C. I. pipe, H. & S.	@	.60	5.40	
Carry forward			$2,547.50	$4,524.23
716 Brought forward				$4,524.23

(*g*) West Spring (No. 18 B).

Brought forward			$2,547.50
(1) Infiltration Lines:			
71′ 0″—4″ vitrified tile pipe in 5′ trench (rock)	@	$2.25	159.75
53′ 0″—4″ vitrified tile pipe in 6′ trench (½ rock)	@	1.50	79.50
200′ 0″—4″ vitrified tile pipe in 10′ trench (¾ rock)	@	3.75	750.00
200′ 0″—4″ vitrified tile pipe double line in 100′ of trench 6′ deep (loose rock)	@	1.00	200.00
1,300′ 0″—4″ vitrified tile pipe in 5′ trench (½ rock)	@	1.30	1,690.00
385 cu. yds. rock hammered into small pieces	@	1.00	385.00
(2) Head House:			
Area of floor = 34 sq. ft.			
Cubic contents, outside dimensions, from bottom of foundation to average height of roof = 485 cu. ft.			
7 cu. yds. earth excavation	@	.50	3.50
6.5 " concrete in basin and walls	@	20.00	130.00
1.1 " reinforced concrete in roof slab	@	20.00	22.00
400 lbs. ¾″ round rods	@	.03	12.00
1 iron door and frame—approximate weight = 160 lbs.	@	.04	6.40
1—7″ x 33″ iron screen over outlet box	@	1.35	1.35
1 hasp and padlock	@	1.00	1.00

The Water Supply.—Continued.

(3) Piping in Head House.

Blow-off:				
5′ 0″—8″ C. I. pipe, H. & S.	@	.90	4.50	
17′ 6″—8″ vitrified tile pipe	@	.20	3.50	
18″ gate valve, set	@	20.90	20.90	
Overflow:				
9′ 6″—6″ C. I. pipe, H. & S.	@	.60	5.70	
				6,022.60
Carry forward				$10,546.83
717 Brought forward				$10,546.83

(*h*) Spring No. 20.

4½ cu.yds. earth excavation	@	$.50	$2.25	
2.4 " concrete in basin	@	20.00	48.00	
1 iron screen 8″ x 16″ over outlet box	@	.75	.75	
40′ 0″—4″ vitrified tile in 4′ trench (earth)	@	.40	16.00	
				67.00

(*i*) Spring No. 21. Ada Spring.

(1) Fencing:

30 rods woven wire fence	@	.60	18.00	
63 fence posts 8′ long, chestnut	@	.30	18.90	
Setting 63 fence posts	@	.25	15.75	

(2) Basin:

163 cu. yds.	earth excavation	@	.40	65.20
163 "	excavation (rock—large boulders)	@	2.00	326.00
870 "	" (shale) on hillside	@	1.50	1,305.00
500 "	" (stone) " "	@	3.00	1,500.00
44½ "	concrete in retaining wall and aprons	@	15.00	667.50
1,630 "	stone hammered to small pcs	@	1.00	1,630.00
326 "	excavated shale, replaced	@	.30	97.80
326 "	earth replaced	@	.20	65.20
8,800 sq. ft.	sod	@	.02	176.00
4' 0"—10"	C. I. pipe	@	1.25	5.00
12' 0"—12"	vitrified tile	@	.40	4.80

(3) Outlet Box from Basin:

3.8 cu. yds.	concrete in walls and bottom	@	20.00	76.00
44 lbs.	½" round rods 4' 8" long, 14 in number	@	.03	1.32
31½ sq. ft.	screen 4' 6" x 7' 0"—¼" mesh	@	.10	3.15
50 bd. ft.	2" oak in cover	@	55.00	2.75
28 lin. ft.	2" quarter round pine	@	.06	1.68
2	strap hinges	@	.16	.32
1	hasp and padlock	@	1.00	1.00
	Carry forward			$5,981.37 $10,613.83

The Water Supply.—Continued.

718	Brought forward				$10,613.83
	Brought forward			$5,981.37	
	(4) Spring House:				
37	cu. yds. excavation	@	$.50	18.50	
46	" concrete	@	15.00	690.00	
64	lin. ft. 2" W. I. pipe in posts	@	.25	16.00	
64	" " 1½" " " " "	@	.18	11.52	
88	lbs. C. I. in 8 column plates	@	.04	3.52	
320	" ¾" round rods in uprights	@	.03	9.60	
16	—⅝" round rods 8 ft. long with rings at ends and turnbuckles, approximate weight = 140 lbs	@	.03	4.80	
8	—clevises	@	.15	1.20	
56	lin. ft. woven wire net 56" high made of ⅛" round wire with 1" mesh and ¼" round rods at edge	@	1.25	70.00	
1	door and frame 19" x 20" made of 1" x 3/16" iron riveted and welded with door panel of wire net	@	2.00	2.00	
2	—12" x 27" iron strainers over outlet box	@	1.75	3.50	
1	—padlock	@	1.00	1.00	
600	bd. ft. pine lumber in roof framing d4s	@	50.00	30.00	
300	" " 1" sheathing on roof	@	50.00	15.00	
230	" " beaded pine ceiling laid in octagon	@	55.00	12.65	
70	lin. ft. 3" x 1" moulding	@	.06	4.20	
	" " 2" moulding	@	.05	3.75	
11	sy. yds. shingles-dipped and painted	@	1.00	11.00	
	All wood and metal above the concrete basin painted 2 coats	@	10.00	10.00	

	(5) Piping at Spring House:				
	Basin to Spring House:				
	16′ 0″—18″ vitrified tile 4′ trench	@	1.25	20.00	
	In Spring House:				
	27′ 0″—18″ vitrified tile	@	.75	20.25	
	1—18″ vitrified tile tee	@	2.00	2.00	
	Caps over 12″ Pipes:				
	2 circular covers, 24″ diameter, made of 2 layers 1″ boards with an iron ring 24″ in outside diameters. Ring of 2″ x ⅜″ iron with 12½″ holes. Each cover held by 12⅜″ x 12″ bolts imbedded in concrete walls of basin	@	2.50	5.00	
	Carry forward			$6,946.86	$10,613.83
719	Brought forward				$10,613.83
	Brought forward			6,946.86	
	(6) Miscellaneous:				
	181 lin. ft. rought stone wall 4′ high no mortar	@	$.35	63.35	
	220 cu. yds. excavation in ditches	@	.50	110.00	
	150′—2″ W. I. pipe	@	.15	22.50	
	43′—¾″ "	@	.05	2.15	
	17′—¼″ "	@	.03	.51	
	1—bibb cock	@	.50	.50	
	1—2″ x 1″ reducer	@	.25	.25	
	1—1″ globe valve	@	1.50	1.50	
	13—evergreen trees set out	@	5.00	65.00	
	100—poplar trees, set out	@	5.00	500.00	
					7,712.62

The Water Supply.—Continued.

(*j*) Spring No. 22.

(1) Land Improvements:

450 cu. yds. grading	@	.40	180.00	
600 " excavation in new river bed	@	.75	450.00	
100 lin. ft. of loose stone wall 3′ high	@	.30	30.00	
(2) Infiltration Lines:				
8 cu. yds. concrete cut-off wall 4′ high x 1′ 0″ thick	@	15.00	120.00	
2′ 0″—8″ vitrified tile	@	.20	.40	
(3) Head House:				
Area of floor = 33 sq. ft.				
Cubic contents, outside dimensions, from top of concrete basin to average height of roof = 232 cu. ft.				
7 cu. yds. of earth excavation	@	.50	3.50	
3.2 " concrete in basin	@	20.00	64.00	
1—5″ x 25″ iron screen over outlet box	@	.75	.75	
1—frame superstructure	@	45.00	45.00	
Carry forward			$893.65	$18,326.45

720	Brought forward				$18,326.45
	Brought forward			$893.65	
	(4) Piping in Head House:				
	Blow-off:				
4′ 0″—8″ C. I. pipe, H. & S.		@	$.90	3.60	
10′ 10″—8″ vitrified tile		@	.20	2.00	
	Overflow:				
38′ 0″—6″ vitrified tile		@	.15	5.70	
					904.95
	Total Item No. 4				$19,231.40
	Depreciation:				
	Ave. age, 5 yrs. Ave. life, 50 yrs. Int. rate, 4%.				
	Annual Depreciation @ .63% = $121.16				
Accrued Depreciation @ 3.5%					673.10
	Net physical value				$18,558.30
Present worth of water rights in connection with above group of Springs					$6,683.00

Item No. 5. Jarrell Spring, Spring No. 19.

This spring is located on an uncleared and unfenced tract of land, one acre in extent. No development has been made.

The Water Supply.—Continued.

Item No. 6. Beaver Pond Spring. Spring No. 23.

(1) Land Improvements:				
47 rods woven wire fence	@	$.60	$28.20	
94 fence posts 8′ long, chestnut	@	.30	28.20	
300 bd. ft. lumber in 150′—3 board fence	@	40.00	12.00	
230 lin. ft. rip rap stone wall 3′ high	@	.30	69.00	
				$137.40
Total Item No. 6				$137.40
Depreciation:				
Ave. age, 16 yrs. Ave. life, 25 yrs. Int. rate, 4%.				
Annual Depreciation @ 2.31% = $3.17.				
Accrued Depreciation @52.4%				72.00
Net physical value				$65.40
Present worth of water rights in connection with above spring				$2,317.00

721

Item No. 8.—Pipe Line from Gravity Springs to City.

(*a*) Cast Iron Pipe.

12,133 lin. ft. 8″ C. I. Pipe, Class "B."			
10,336 " " 4″ " " " "			
3,652 " " 3″ " " " "			
Weight of above pipe = 343.8 tons	@	$26.50	$9,110.70

Cast Iron Specials on Above Pipe:

1—6″ x 6″ x 6″ tee.
6—6″ x 6″ x 6″ "Y" branches.
7—4″ x 4″ x 4″ " "
4—6″ x 4″ reducers.
6—4″ x 3″ "
2—6″ sleeves.
11—4″ "
8—3″ "

Weight of above specials = 3,787#	@	.03¼	123.00	
Valves:				
4—6″ double gate valves, set	@	13.60	54.40	
13—4″ " " " "	@	8.65	112.45	
4—4″ check valves, set	@	10.50	42.00	
				$9,442.63

(*b*) Laying the Pipe Lines.

Ordinary trenching including excavation, laying, yarn, lead and backfill. All pipe having 2 ft. cover.

The excavation was made difficult and expensive by the presence of a great many boulders and thin rock ledges, as well as the distance from town at which some of the work was carried on.

12,133 lin. ft. of 6″ pipe	@	$.45	$5,459.85	
10,336 " " " 4″ "	@	.40	4,134.40	
3,652 " " " 3″ "	@	.35	1,278.30	
				10,872.45

The Water Supply.—Continued.

(c) Extra for Unusual Excavation.

Solid Rock Trenches:

The trenches lie through solid limestone which is very hard and brittle making drilling and blasting expensive. The strata lie in an almost vertical plane.

Carry forward				$20,315.08
722 Brought forward				$20,315.08
708 cu. yds. rock excavation	@	$2.50	$1,770.00	

Shale Trenches:

The shale is extremely tough and lying in a nearly vertical plane, it is impossible to blast, while picking is very slow work.

1,530 lin. ft. shale trench	@	.25	382.50	2,152.50
Total Item No. 8				$22,467.58

Depreciation:

Ave. age 7 yrs. Ave. life 75 yrs. Int. rate 4%. Annual Depreciation @ .214% = $48.08. Accrued Depreciation @ 1.76%	395.43
Net physical value	$22,072.15

Item No. 9. Pipe Line from Ada Springs to City

(a) Cast Iron Pipe.

21,570 lin. ft. of 10" C. I. pipe.
9,401 " " " 8" " "
2,843 " " " 6" " "
2,055 " " " 4" " "
7,094 " " " 3" " "

[redacted]

Weight of above pipe = 1,150.4 tons..... @ $26.50 $30,485.60

Cast Iron Specials:

1 10" x 10" x 10" "Y" branch.
2 10" x 10" x 6" " "
2 8" x 8" x 8" " "
3 8" x 8" x 6" " "
1 8" x 8" x 4" " "
1 6" x 6" x 6" " "
2 4" x 4" x 4" " "

Carry forward $30,485.60

723 *The Water Supply.*—Continued.

Brought forward			$30,485.60	
5 10″ x 10″ x 6″ tees.				
1 6″ x 6″ x 6″ tee.				
2 4″ x 4″ x 4″ "				
2 10″ 90° bends.				
5 10″ 45° "				
3 6″ " "				
2 4″ " "				
9 3″ " "				
1 10″ 22½° "				
74 3″ sleeves.				
8 4″ "				
3 6″ "				
4 8″ "				
2 10″ "				
1 10″ x 8″ reducer.				
7 6″ x 4″ "				
6 4″ x 3″ "				
Weight of above specials = 13,334#	@	$.03½	466.69	
Valves:				
8 4″ double gate valves, set	@	9.15	73.20	
9 6″ " " " "	@	14.60	131.40	
1 8″ " " " "	@	21.40	21.40	
1 10″ " " " "	@	28.20	28.20	
1 6″ horizontal check valve, set	@	16.60	16.60	
2 10″ " " " "	@	37.40	74.80	
				$31,297.89

(*b*) Laying Pipe Line.

Ordinary trenching including excavation, laying, lead, yarn and backfill, all pipe having 2 ft. of cover.

21,570 lin. ft. 10″ pipe	@	.35	$7,549.50		
9,401 " " 8″ "	@	.30	2,820.30		
2,943 " " 6″ "	@	.25	735.75		
2,055 " " 4″ "	@	.22	452.10		
7,094 " " 3″ "	@	.20	1,418.80		
				12,976.45	
Carry forward					$44,274.34
724 Brought forward					$44,274.34

(*c*) Extra for Unusual Excavation.

Rock Trenches:

These trenches lie through solid limestone ledges which have been turned so that their stratification lines lie almost vertically.

3,065 cu. yds. rock excavation	@	$2.50	$7,662.50	

Shale Trenches:

The shale encountered was very difficult to excavate owing to its lying in vertical planes and having to be picked out. Most of the shale trenches were more or less wet.

4,200 lin. ft. shale trenches	@	.25	1,050.00	

The Water Supply.—Continued.

Wet Trenches:				
Constant pumping or bailing required.				
6,400 lin. ft. wet trenches	@	.15	960.00	
Steep Hillside Trenches:				
700 lin. ft. trench	@	.20	140.00	
(*d*) Miscellaneous Crossings.				
6 stream crossings—river averages 10 ft. wide x 1½ ft. deep; 3 of these crossings are in rock and 1 in hard blue shale	@	25.00	150.00	
River and Railroad Crossings:				
Where the pipe passes through the railroad fill, it lies along with the river in a masonry culvert 25 feet in width and 100 ft. long. The excavation is through solid rock. Small shots had to be used, in order to prevent damage being done to the culvert, while the water of the river was a serious item to contend with.				
2 of the above crossings	@	125.00	250.00	
				10,212.50
Carry forward—Total of Item No. 9				$54,486.84

Brought forward—Total Item No. 9				$54,486.84
Depreciation:				
Ave. age 7 yrs. Ave. life 75 yrs. Int. rate 4%. Annual Depreciation @ .214%=$116.60.				
Accrued Depreciation @ 1.76%				958.97
Net physical value				$53,527.87

Item No. 10. Pipe Line from Beaver Pond to City.

(*a*) Cast Iron Pipe.

3,440 lin. ft. of 10" C. I. pipe, weighing 99.7 tons	@	$25.90	$2,582.23	

(*b*) Laying the Pipe Line.

Ordinary trenching including excavation, laying, yarn, lead and backfill. All pipe under 2 ft. of cover. This pipe line lies through fields which are accessible with teams and light loads.

3,440 lin. ft. of 10" C. I. pipe	@	.35	1,204.00	

(*c*) Extra for Unusual Excavation.

Solid Rock:

Two ledges of solid limestone were encountered which were extremely hard.

155 cu. yds. rock excavation	@	2.50	387.50	
				4,173.73
Total Item No. 10				$4,173.73

The Water Supply.—Continued.

Depreciation:

Ave. age 23 yrs. Ave. life 75 yrs. Int. rate 4%.
Annual Depreciation @ .214%=$8.93.

Accrued Depreciation @ 8.2%	342.25
Net physical value	$3,831.48

725½ *The Pumping Stations.*

726 Item No. 11. The Ada Station Building.

(*a*) The Building.

Cubical contents, outside dimensions from average bottom of footings to average height of roof = 223,000 cu. ft.

(1) Excavation:

Rock on ledge included in station ground improvements.

331 cu. yds. of excavation requiring bracing	@	$.75	$248.25	$248.25

(2) Foundations to Floor Line:

264 cu. yds. concrete	@	8.50	2,244.00	2,244.00

(3) Walls:

76 cu. yds. concrete in walls (2′ thick)	@	8.50	646.00	
2,900 common brick (red) set in Portland cement mortar	@	17.00	49.30	
4,138 sq. ft. of 15″ cement block wall, openings included	@	.41	1,696.58	
4,544 sq. ft. of 20″ cement block wall, openings included	@	.50	2,272.00	
112 sq. ft. 10″ cement block wall, openings included	@	.29	32.48	
130 iron wall stays, 2½″ x ¼″ x 10″	@	.25	32.50	
				4,728.86

(4) Structural Steel in Roof Trusses:

5 Pratt trusses, 51′ 5″ span, 13′ 0″ high with ventilator and lateral bracing, weighing 52,000 lbs.	@	.06	3,120.00	3,120.00

(5) Lumber in Roof and Ventilator:

2,967 bd. ft. poplar joists, purlins and framing	@	40.00	118.68	
14,750 " No. 1 common dressed poplar in sheathing	@	45.00	663.75	
1,243 " No. 1 poplar, dressed, in ventilator	@	45.00	55.93	
1,430 " 3″ x 6″ No. 1 poplar in Jack rafters	@	40.00	57.20	
1,120 " 2½″ x 3″ poplar moulding	@	.07	78.40	
				973.96
Carry forward				$11,315.07

The Water Supply.—Continued.

727	Brought forward				$11,315.07
	(6) Roofing and Gutters:				
6,420 sq. ft. 6½″ x 13″ x ½″ flat tile roofing with copper nails		@	$18.00	$1,155.60	
113 lin. ft. fancy tile ridge roll		@	.40	45.20	
1,050 sq. ft. galv. iron gutter and flashing		@	.12	126.00	
320 bd. ft. No. 1 poplar in gutter		@	45.00	14.40	
					1,341.20
	(7) Downspouts:				
154 lin. ft. 4″ corrugated downspouts		@	.20	30.80	
20 90° bends		@	.30	6.00	
					36.80
	(8) Painting:				
All exterior wood and metal work painted two coats		@	40.00	40.00	40.00
	(*b*) Engine Room.				
Area of floor = 2,940 sq. ft.					
	(1) Floor:				
2,000 sq. ft. of 8″ concrete floor laid on 18″ of cinders, 1½″ top cost of 1:2 Portland cement and sand, 6½″ base of Portland cement, sand and stone		@	.25	500.00	500.00

(2) Interior Trim:

Oak wainscoting 6′ 0″ high, 216 lin. ft. containing:

1,950 bd. ft. dressed oak lumber	@	50.00	97.50	
216 lin. ft. 1″ x 5″ cap with 1 edge rounded	@	.05	10.80	
216 lin. ft. 2″ x 2″ moulding	@	.05	10.80	
				119.10

(3) Doors and Windows:

Window sashes and outside of frames white pine, inside of frame oak. Doors, oak inside finish, frame white pine.

Carry forward				$13,352.17
728 Brought forward				$13,352.17
1 pair outside sliding doors, 10′ x 14′ with 20—10″ x 15″ lights, 1¾″ sash in top of each piece door, one piece door hung with hinges 2′ 10″ x 5′ 2″. This pair of doors shows segmental top outside (rad. 10′ 0″) and square inside and is hung	@	$70.00	$70.00	
1 inside door and frame 3′ 4″ x 10′ 0″ to segment (rad. 3′ 4″) with 10″ x 15″—6 light pivot transom—size of door 3′ 0″ x 6′ 6″	@	25.00	25.00	
1 inside door and frame 3′ 4″ x 7′ 4″ to segment (rad. 3′ 4″)	@	20.00	20.00	
4 twin windows, frames, weights and cords for 15″ wall. Top sashes segmental (radius 6′ 9″). Opening 6′ 9″ x 10′ 0″. Four sashes of 12—10″ x 15″ lights each	@	40.00	160.00	
2 twin windows, frames, weights and cords for 20″ wall. Top sashes segmental (radius 6′ 9″). Opening 6′ 9″ x 10′ 0″. Four sashes of 12—10″ x 15″ lights each	@	40.00	80.00	

The Water Supply.—Continued.

1 twin window, frame, weights and cords for 20″ wall. Opening 5′ 4″ x 6′ 9″. Two sashes rabbetted to pivots—segmental top (radius 6′ 9″) with 12—10″ x 15″ lights each	@	25.00	25.00	
1 single window and frame—fixed for 20″ wall. Opening 5′ 4″ x 4′ 1″. Segmental top (rad. 4′ 1″). One sash with 16—10″ x 15″ lights	@	15.00	15.00	395.00
Carry forward				$13,747.17
729 Brought forward				$13,747.17

(4) Painting and Varnishing:

Inside walls painted two coats white and the joints between the blocks outlined in red. Roof truss and underside of sheeting painted two coats graphite paint.

5,100 sq. ft. wall painted two coats	@	$.03	153.00	
3,700 " roof sheathing painted two coats	@	.02	74.00	
Woodwork filled and varnished with two coats varnish	@	30.00	30.00	257.00

(*c*) Boiler Room.

Area of floor = 1,310 sq. ft.

(1) Floor:

750 sq. ft. of 8″ concrete floor laid on 18″ of cinder, 1½″ top coat of 1:2 Portland cement and sand, 6½″ base of 1:3:5 Portland cement, sand, and stone	@	.25	187.50	187.50

	(2) Doors and Windows:				
1	pair outside sliding doors 10′ x 14′ with 20 10″ x 15″ lights, 1¾″ sashes in the top of each piece door. One door has wicket door hung with hinges 2′ 10″ x 5′ 2″. This pair of doors shows segmental top outside (rad. 10′ 0″) and square inside, and is hung on McCabe door hinges	@	70.00	70.00	
3	twin windows; frames, weights and cords for 15″ wall. Top sashes segmental (rad. 6′ 9″). Opening 6′ 9″ x 10′ 0″. Four sashes of 12 10″ x 15″ lights each	@	40.00	120.00	120.00
	Carry forward			$190.00	$14,191.67
730	Brought forward				$14,191.67
	Brought forward			$190.00	
1	twin window; frame weights and cords for 20″ wall. Top sashes segmental (rad. 6′ 9″). Opening 6′ 9″ x 10′ 0″. Four sashes of 12 10″ x 15″ lights	@	$40.00	40.00	
3	twin windows and frames for 20″ wall. 2 sashes rabbetted to pivots. Segmental top (rad. 6′ 9″), with 12 10″ x 15″ light sashes. Opening 5′ 4″ x 6′ 9″	@	25.00	75.00	
5	single windows and frames for 15″ wall. Sash rabbetted to pivots, segmental top (rad. 4′ 1″), 8 10″ x 15″ lights. Opening 2′ 9″ x 4′ 1″	@	10.00	50.00	355.00
	(3) Painting:				
	Roof trusses painted two coats graphite paint	@	50.00	50.00	50.00
	(4) Miscellaneous:				
4	3″ x 3″ x 4.8 x 3′ 6″ long angles bolted to coal bin opening, weighing 67 lbs.	@	.05	3.35	3.35

The Water Supply.—Continued.

(*d*) Coal Bin.

Cubical contents, net = 6,250 cu. ft.
Area of floor = 500 sq. ft.

(1) Floor:

500 sq. ft. of 8″ concrete floor, 1½″ top coat of 1:2 Portland cement and sand, 6½″ base of 1:3:5 Portland cement, sand and stone	@	.22	110.00	110.00
Carry forward				$14,710.02
731 Brought forward				$14,710.02

(2) Roof:

2 6″—12.25# "I" beams 18′ long.
5 5″ x 3″ x 8.2# angles, 36′ 7″ long.
8 6″ x 6″ x 14.9# " 8″ "

Weight of above steel = 2,000 lbs	@	$.06	$120.00	
680 bd. ft. 1″ sheathing, poplar	@	45.00	30.60	
35½ lin. ft. 10″ x ⅞″ dressed poplar trim	@	.05	1.77	
35½ " 2″ x 2″ moulding	@	.05	1.77	
35½ " 4″ x 1″ cap	@	.02	.71	
76 squares tar paper	@	1.25	95.00	249.85

(3) Painting:

Trim of roof painted two coats	@	3.00	3.00	3.00

(e) Tool Room.

Cubic contents, net = 1,400 cu. ft.
Area of floor = 112 sq. ft.

(1) Floor:				
112 sq. ft. 8″ concrete floor, 1½ top coat of 1:2 Portland cement and sand, 6½″ base of 1:3:5 Portland cement, and stone	@	.20	22.40	22.40
(2) Roof:				
5 5″ x 3″ x 8.2# angles 8′ 3″ long, weight 340 lbs	@	.05	17.00	
157 bd. ft. 1″ sheathing, poplar	@	45.00	7.06	
8½ lin. ft. 10″ x ⅞″ dressed poplar trim	@	.05	.41	
8½ " 2″ x 2″ moulding	@	.05	.41	
17½ sq. yds. tar paper	@	1.25	21.87	
				46.75
(3) Shelving:				
104 bd. ft. ⅞″ dressed poplar shelving	@	45.00	4.68	
				4.68
Carry forward				$15,036.70
732 Brought forward				$15,036.70
(4) Painting:				
750 sq. ft. walls and shelves painted two coats	@	$.02	$15.00	
				15.00
Total Item No. 11				$15,051.70

The Water Supply.—Continued.

Depreciation:

Ave. age 9 yrs. Ave. life 50 yrs. Int. rate 4%.
Annual Depreciation @ .63% = $94.83.

Accrued Depreciation @ 6.9%				1,038.57
Net physical value				$14,013.13

Item No. 12. Steel Stack.

(*a*) Excavation.

187 cu. yds. of muck excavation 16 ft. deep—bracing required	@	1.00	$187.00	$187.00

(*b*) Foundation.

90 cu. yds. mass concrete containing large boulders	@	6.00	540.00	
41 cu. yds. concrete (forms required)	@	7.50	307.50	
2,700 fire brick	@	35.00	94.50	
2 tons fire clay	@	5.00	10.00	
1 C. I. clean out door and frame 20″ x 30″ opening. Approximate weight 400 lbs	@	.04	16.00	
1 C. I. chimney pit cover and frame 3′ 10½″ x 4′ 10½″ opening- Approximate weight = 770 lbs	@	.04	30.80	
				998.80

(c) Stack.

1 steel stack 100′ 0″ high x 4′ 0″ weighing 21,500 lbs.	@	.05	1,075.00	
7,500 lbs. of cast iron in base and 6 anchor plates	@	.03	225.00	
550 lbs. of steel in 6 anchor bolts	@	.05	27.50	
9,500 circle fire brick in chimney	@	40.00	380.00	
1,400 common red brick in lining	@	20.00	28.00	
2 tons of fire clay in lining	@	5.00	10.00	
				1,745.50
Carry forward—Total Item No. 12				$2,931.30
733 Brought forward—Total Item No. 12				$2,931.30
Depreciation:				
Ave. age, 9 yrs. Ave. life, 30 yrs. Int. rate, 4%. Annual Depreciation @ 1.71% = $50.13.				
Accrued Depreciation @ 18.9%				554.02
Net physical value				$2,377.28

Item No. 13. Coal Chute.

62 cu. yds. concrete in walls and roof	@	12.00	$744.00	
2,004 lbs. of 1¼″ round rods (35 14′ long) in roof	@	.03	60.12	
127 sq. yds. woven wire fence in roof	@	.50	63.50	
				$867.62
Total, Item No. 13				$867.62

The Water Supply.—Continued.

Depreciation:

Ave. age, 9 yrs. Ave. life, 50 yrs. Int. rate, 4%.
Annual Depreciation @ .63% = $5.47.

Accrued Depreciation @ 6.9%				59.87
Net physical value				$807.75

Item No. 14. Oil House.

Cubic contents from bottom of footings to average height of roof = 611 cu. ft.
Area of floor = 61 sq. ft.

(*a*) Foundation.

3 cu. yds. concrete	@	12.00	$36.00	$36.00

(*b*) Walls.

213 sq. ft. 8″ concrete block wall	@	.20	42.60	
1/3 cu. yd. concrete in end walls	@	12.00	4.00	
				46.60
Carry forward				$82.60

734 Brought forward				$82.60
(c) Roof.				
2.7 cu. yds. reinforced concrete arch roof 6" thick	@	$16.00	$43.20	
383 lbs. ¾" round rods	@	.03	11.49	
270 sq. ft. woven wire fencing	@	.05	13.50	
				68.19
(d) Floor.				
Cinders	@	2.50	2.50	2.50
(e) Door.				
1—3′ 0″ x 7′ 0″ door and frame 3′ 4″ x 7′ 4″ top to segment. Door oak finished on one side. (Same as inside door in pumping station). Unpainted	@	15.00	15.00	15.00
Total, Item No. 14				$168.29
Depreciation:				
Ave. age, 9 yrs. Ave. life, 50 yrs. Int. rate, 4%. Annual Depreciation @ .63% = $1.06.				
Accrued Depreciation @ 6.9%				11.61
Net physical value				$156.68
Item No. 15. The Worthington Pump.				
(a) Pumping Engine.				
1 Worthington, double acting, horizontal duplex pumping engine of 1.5 million gallon capacity				$1,200.00

The Water Supply.—Continued.

(*b*) Foundation.

10 cu. yds. earth excavation	@	.50	$5.00	
8 " stone masonry laid in Portland cement	@	8.50	68.00	
1 4′ 3″ x 9′ 10″ x ½″ iron plate bolted on top of foundation with 4 1″ anchor bolts 4′ long. Approximate weight of plate = 850 pounds	@	.04	34.00	
				107.00
Carry forward				$1,307.00
735 Brought forward				$1,307.00

(*c*) Concrete Pit.

10½ cu. yds. of concrete including 4 steps	@	$8.50	$89.25	89.25

(*d*) Suction and Discharge Piping.

8′ 4″—10″ W. I. screw pipe	@	1.00	8.33	
2 —10″ extra heavy flanged couplings	@	6.40	12.80	
7′— 8″ " " W. I. screw pipe	@	1.24	8.68	
2 — 8″ " " flanged couplings	@	3.90	7.80	
Cutting, threading and erecting above piping	@	5.00	5.00	
				42.61
Total, Item No. 15				$1,438.86

Depreciation:

Ave. age, 15 yrs. Ave. life, 20 yrs. Int. rate, 4%.
Annual Depreciation @ 3.23% = $46.48.

Accrued Depreciation @ 67.2%	966.91
Net physical value	$471.95

Item No. 16. The Snow Pump.

(*a*) Pumping Engine.

1 horizontal, cross-compound, high duty, crank and flywheel, condensing pumping engine of a rated capacity of 1.5 M. G. D. against a total water pressure, including suction lift of 305 lbs. per sq. in. The valve motion is of the Corliss type. 4 single acting, outside packed, plungers. The pumping engine is complete with—

1 500 sq. ft. surface condenser.
1 6″ x 8″ x 7″ rotary dry vacuum pump.
1 4½″ x 3¾″ x 4″ duplex wet vacuum pump.
2 air pumps.
4 air chambers.
1 3″ x 2″ x 3″ duplex jacket pump.
1 reheating receiver.

736 Delivery relief and by-pass valve and all interior piping, valves, and traps for connecting these parts with each other and with the engine inside of their common nozzles, including all piping from the throttle valve on the steam end to and including the breeching "Y" on the suction and discharge end. Gages, oilers, revolution counters, lubricator and other accessories are furnished with the pumping engine.

Erected complete	$15,000.00

The Water Supply.—Continued.

(*b*) Foundation.

63 cu. yds. rock excavation	@	$4.50	$283.50	
34 " " earth "	@	.50	17.00	
114 " " of concrete	@	8.50	969.00	
				1,269.50

(*c*) Suction and Discharge Piping.

6′ 0″—10″ C. I. flanged pipe (ex. heavy).
21′ 6″—12″ " " "
1—12″ " " ⅛ bend.
1—12″ " " "Y"

Weight of above flanged pipe and specials—approximately 3,268 lbs.	@	.05	163.40	
2 12″ Eddy gate valves, set	@	38.00	76.00	
1 10″ heavy Eddy gate valve, set	@	76.00	76.00	
1 10″ " Chapman check valve with ¾″ pipe by-pass made of the following:				
2′—¾″ W. I. screw pipe—ex. heavy.				
2 —¾″ ells, extra heavy.				
1 —¾″ union, " "				
1 —¾″ globe valve.				
Complete	@	60.00	60.00	375.40
Carry forward—Total Item No. 16				$16,644.90
737 Brought forward—Total Item No. 16				$16,644.90

Depreciation:

Ave. age 9 yrs. Ave. life 40 yrs. Int. rate 4%.
Annual Depreciation @ 1.012%=$168.45.

Accrued Depreciation @ 11.2%				1,864.23
Net physical value				$14,780.67

Item No. 17. Auxiliaries.

(*a*) Feed Water Pump.

1 Epping-Carpenter #6772, duplex, steam pump 5¼" x 3½" x 5", taking suction from hot water tank				125.00

(*b*) Feed Water Heaters.

(1) Worthington Pump Heater:

Vertical heater 4' 10" high and 2' 8" in diameter, supported by 3 iron legs			$150.00	
(*a*) Foundation:				
2½ cu. yds. of excavation	@	$.50	1.25	
2 " " " concrete	@	10.00	20.00	
3 C. I. legs, approximate weight=135 pounds	@	.04	5.40	

The Water Supply.—Continued.

(*b*) Fittings:

2′ 0″—1½″ ex. heavy W. I. screw pipe	@	.10	.20	
1—1½″ ex. heavy tee	@	.10	.10	
1—1½″ " " elbow	@	.07	.07	
1—1½″ x 1¼″ bushing	@	.05	.05	
1—1½″ x ¾″ "	@	.10	.10	
1—¾″ brass safety valve	@	3.35	3.35	
Erecting fittings	@	1.50	1.50	
(2) Secondary Heater:				
1 Wheeler feed water heater supplied with steam from the exhaust of the auxiliary pumps, in place			175.00	
Carry forward			$357.02	$125.00
738 Brought forward				$125.00
Brought forward			$357.02	
(3) Primary Heater:				
Primary Heater	@	200.00	557.02	

(*c*) Oil Separator and Tank.

1 Cochrane 14″ horizontal, vacuum oil separator (Fig. 21 in catalogue)	@	200.00	200.00	
1 steel tank 6′ 6″ long—20″ diameter resting on floor	@	50.00	50.00	

Fittings:				
3′ 0″—1½″ ex. hvy. W. I. screw pipe	@	.10	.30	
6′ 0″—1″ " " " " " "	@	.06	.36	
1—1½″ " " flanged union	@	.59	.59	
1—1″ " " " "	@	.38	.38	
1—1½″ " " 45° bend	@	.10	.10	
2—1″ " " elbow	@	.04	.08	
1—1½″ gate valve	@	2.00	2.00	
1—1″ " "	@	1.00	1.00	
Erecting above fittings	@	2.50	2.50	
				257.31
(*d*) Hot Water Tank.				
1 vertical steel tank 8′ 0″ high x 2′ 0″ diameter. All water from steam lines, traps and condensed water pumped by wet vacuum and jacket pumps are collected here and any deficiency in the amount needed by the boiler feed pump is made up by fresh water added to the tank by means of an automatic regulator	@	75.00	75.00	
(*e*) Steam Separator.				
1 4″ separator on Snow pump	@	35.00	35.00	110.00
Total Item No. 17				$1,049.33

The Water Supply.—Continued.

Depreciation:

Ave. age 9 yrs. Ave. life 30 yrs. Int. rate 4%.
Annual Depreciation @ 1.71%=$17.94.

Accrued Depreciation @ 18.9%	198.32
Net physical value	$851.01

739 Item No. 18. Boiler Plant.

(*a*) 1 Battery containing two sterling 148 H. P. boilers. Each boiler has 1,477 sq. ft. of submerged heating surface and 35.7 sq. ft. of grate surface. Boilers designed for 150# operating pressure and tested to 225# hydrostatic pressure. They are complete with cast iron front, doors, grates, etc., and are fitted with 12" steam gauges, consolidated pop safety valves, Reliance water columns with water gauge, quick closing water glass valves, gauges cocks, blow-off valves and drain pipes to ash pits.

296 H. P. erected complete	@	$11.00	$3,256.00	$3,256.00

(*b*) Miscellaneous Piping on Both Boilers.

5′ 0″—3″ W. I. screw pipe, ex. hvy	@	.25	1.25
10′ 0″—2½″ " " " " "	@	.19	1.90
19′ 0″—1½″ " " " " "	@	.10	1.90
45′ 0″—¾″ " " " " "	@	.04	1.80
6′ 0″—½″ " " " " "	@	.03	.18
15′ 0″—¼″ " " " " "	@	.03	.45
4—1½″ tees, extra heavy	@	.10	.40
2—¾″ " " "	@	.04	.08
2—¼″ " " "	@	.03	.06
2—2½″ elbows, " "	@	.19	.38

2—1½" " " "	@	.07	.14	
12—¾" " " "	@	.03	.36	
6—¼" " " "	@	.02	.12	
4—¾" 45° " " "	@	.05	.20	
2—¾" unions, " "	@	.10	.20	
2—2½" x 1½" brushings, extra heavy	@	.18	.36	
2—1½" x ¾" " " "	@	.10	.20	
4—1½" plugs	@	.03	.12	
2—1½" flange unions	@	.59	1.18	
2—¾" globe valves, Chapman	@	5.50	11.00	
4—¾" " "	@	5.50	22.00	
2—¼" " "	@	3.00	6.00	
2—1½" " "	@	12.80	25.60	
Cutting, threading and erecting above piping	@	20.00	20.00	
				95.88
Carry forward				$3,351.88
740 Brought forward				$3,351.88

(c) Boiler Blow-off Pipes for Both Boilers.

26' 0"—3" W. I. screw pipe, ex. hvy	@	$.25	$6.50	
48' 0"—2½" " " " " " "	@	.19	9.12	
1—3" tee	@	.39	.39	
4—2½" tees	@	.26	1.04	
7—2½" elbows	@	.19	1.33	
2—3" x 2" bushings	@	.20	.40	
2—2½" blow-off valves	@	20.00	40.00	
Cutting, threading and erecting above piping	@	10.00	10.00	

The Water Supply.—Continued.

Safety Valve Vent:				
76′ 0″—3″ W. I. screw pipe, erected	@	.30	22.80	
4—3″ elbows	@	.27	1.08	
				92.66
(*d*) Boiler Settings.				
*170 cu. yds. earth excavation in trench	@	.50	85.00	
*142 " " concrete	@	8.00	1,136.00	
61 sq. ft. 8″ concrete floor in ash pit	@	.20	12.20	
49,400 common red brick in Portland cement mortar	@	17.00	839.80	
16,300 fire brick	@	30.00	489.00	
6 tons fire clay	@	5.00	30.00	
				2,592.00
(*e*) Smoke Flue.				
60 cu. yds. earth excavation	@	.50	30.00	
6.7 " concrete in walls and roof	@	10.00	67.00	
7,000 fire brick	@	35.00	245.00	
1—C. I. clean out door and frame, approximate weight = 1,400#	@	.04	56.00	
2—tons fire clay	@	5.00	10.00	
				408.00
Carry forward—Total Item No. 18				$6,444.54

*Includes foundation for an additional battery of 2—148 H. P. Boilers.

741	Brought forward—Total Item No. 18			$6,444.54
	Depreciation:			
	Ave. age 9 yrs. Ave. life 25 yrs. Int. rate 4%. Annual Depreciation @ 2.31% = $148.87.			
	Accrued Depreciation @ 25.4%			1,636.91
	Net physical value			$4,807.63

Item No. 19. All Piping in Station.

(a) Hot Water Pipes.

114'—1½" extra heavy W. I. screw pipe, asbestos covered	@	$.28	$31.90
74'—2" extra heavy W. I. screw pipe, asbestos covered	@	.33	24.42
2—1½" extra heavy tees	@	.10	.20
1—2" " " "	@	.15	.15
9—1½" " " elbows	@	.07	.63
12—2" " " "	@	.10	1.20
1—2" " " 45° bend	@	.15	.15
2—1½" " " flanged union	@	.59	1.18
1—2" " " " "	@	.71	.71
1—2" plug	@	.03	.03
2—2" x 1½" bushings	@	.05	.10
3—1½" globe valves	@	3.85	11.55
1—2" brass flanged gate valve	@	16.20	16.20
1—½" " check valve with companion flange	@	12.80	12.80
Cutting, threading and erecting above piping	@	40.00	40.00
			141.22

The Water Supply.—Continued.

(*b*) Miscellaneous Water Pipes.

59′ 0″—2″ ex. hvy. W. I. screw pipe	@	.13	7.67	
32′ 6″—1½″ " " " " "	@	.10	3.25	
101′ 0″—1″ " " " " "	@	.06	6.06	
20′ 0″—½″ " " " " "	@	.03	.60	
Carry forward			$17.58	$141.22
742 Brought forward				$141.22
Brought forward			$17.58	
4—2″ extra heavy tees	@	$.15	.60	
1—1½″ " " "	@	.10	.10	
8—1″ " " "	@	.05	.40	
2—1½″ " " "	@	.10	.20	
5—2″ " " elbows	@	.10	.50	
2—1½″ " " "	@	.07	.14	
12—1″ " " "	@	.04	.48	
5—½″ " " "	@	.02	.10	
3—2″ " " flanged unions	@	.85	2.55	
2—½″ " " unions	@	.33	.66	
5—2″ " " 45° bends	@	.15	.75	
1—2″ " " cross	@	.26	.26	
1—2″ x 1¼″ bushing	@	.08	.08	
1—2″ x 1″ "	@	.10	.10	

3—1″ x ½″ “	@	.05	.15	
1—2″ plug	@@	.03	.03	
4—1″ plugs	@@	.02	.08	
2—½″ “	@@	.01	.02	
1—2″ check valve	@@	6.00	6.00	
1—2″ gate valve	@@	9.00	9.00	
4—2″ flanged gate valves	@@	18.00	72.00	
1—1¼″ “ “ “ (brass)	@@	11.25	11.25	
4—1″ globe valves (2 Chapman)	@@	6.00	24.00	
2—½″ “ “	@@	1.00	2.00	
1—1½″ Chapman flanged globe valve	@@	16.80	16.80	
1—2″ Foster #56019 flanged pressure regulator	@@	50.00	50.00	
1—1½″ pressure regulator	@@	25.00	25.00	
1—2″ plug valve	@@	15.00	15.00	
1—1″ “ “	@@	5.00	5.00	
1—ball cock, box and float	@@	25.00	25.00	
1—2″ flange relief valve—brass, angle outlet—Lunkenheimer	@@	20.00	20.00	
Cutting, threading and erecting above piping	@	30.00	30.00	
				335.83

(*c*) Steam Piping in Station.

Main Steam Header and Header for Auxiliaries:

21′ 0″—8″ ex. hvy. W. I. screw pipe (asb. covered)	@	1.83	38.43	
12′ 0″—5″ “ “ W. I. screw pipe (asb. covered)	@	.91	10.92	
Carry forward			$49.35	$477.05

The Water Supply.—Continued.

743	Brought forward				$477.05
	Brought forward			$49.35	
	33′ 0″—2″ ex. hvy. W. I. screw pipe (asbestos covered)	@	$.33	10.89	
	33′ 8″—1½″ ex. hvy. W. I. screw pipe (asbestos covered)	@	.28	9.42	
	2—8″ x 5″ extra heavy, flanged tees	@	18.65	37.30	
	1—8″ x 2″ " " " tee	@	18.65	18.65	
	1—8″ x 1″ " " " "	@	18.65	18.65	
	1—2″ extra heavy tee	@	.15	.30	
	7—1½″ " " "	@	.10	.70	
	1—2″ " " elbow	@	.10	.10	
	2—1½″ " " "	@	.07	.14	
	3—8″ " " flanged couplings	@	5.00	15.00	
	2—5″ " " " "	@	2.30	4.60	
	2—1½″ " " " "	@	.75	1.50	
	1—2″ x 1½″ bushing	@	.05	.05	
	1—1½″ plug	@	.02	.02	
	4—5″ flanged globe valves	@	32.50	130.00	
	1—2″ " " " (brass)	@	16.20	16.20	
	Cutting, threading and erecting above piping	@	50.00	50.00	
					362.87
	Steam Line to Snow Pump:				
	19′ 0″—4″ extra heavy W. I. pipe containing 1 90° bend (asbestos covered)	@	.75	14.25	
	1—4″ extra heavy flanged couplings	@	1.80	1.80	
	1—4″ flanged globe valve	@	25.00	25.00	
	Erecting above piping	@	10.00	10.00	
					51.05

Steam Line to Worthington Pump:

15′ 6″—5″ extra hvy. W. I. screw pipe	@	.53	8.22	
53′ 0″—4″ " " " " " "	@	.38	20.14	
1—4″ extra heavy 90° bend	@	.44	.44	
2—5″ " " elbow	@	.73	1.46	
1—4″ " " "	@	.44	.44	
Carry forward			$30.70	$890.97
744 Brought forward				$890.97
Brought forward			$30.70	
1—4″ extra heavy, flanged elbow	@	$4.05	4.05	
1—5″ " " " union	@	2.30	2.30	
3—4″ " " " "	@	1.70	5.10	
1—8″ x 4″ reducing flange	@	3.90	3.90	
1—4″ Chapman flanged globe valve	@	25.00	25.00	
1—4″ solid brass " " "	@	36.00	36.00	
3′ 6″—¼″ W. I. screw pipe	@	.02	.07	
2—¼″ globe valves	@	1.00	2.00	
1—1 pt. lubricator	@	7.50	7.50	
Cutting, threading, and erecting above piping	@	20.00	20.00	
				136.62

The Water Supply.—Continued.

Auxiliary Exhaust Header:				
25′ 0″—3″ ex. hvy. W. I. screw pipe	@	.25	6.25	
17′ 0″—2″ " " " " " "	@	.13	2.21	
5—3″ extra heavy tees	@	.39	1.95	
4—2″ " " "	@	.15	.60	
1—3″ " " elbow	@	.27	.27	
1—3″ " " flanged union	@	1.25	1.25	
1—3″ x 2″ bushing	@	.20	.20	
2—3″ globe valves	@	14.00	28.00	
Cutting threading and erecting above piping	@	7.50	7.50	
				48.23
Steam Exhaust & Miscellaneous Piping for Boiler Feed Pump:				
2′ 0″—2½″ W. I. screw pipe	@	.19	.38	
8′ 0″—1¼″ " " "	@	.07	.56	
16′ 0″—¾″ " " " , ex. hvy	@	.04	.64	
4′ 0″—¼″ " " " , " "	@	.03	.12	
2—1¼″ elbows	@	.06	.12	
1—1¼″ flanged union	@	.55	.55	
1—2″ x 1¼″ bushing	@	.09	.09	
2—¾″ extra heavy elbows	@	.03	.06	
1—¾″ flanged coupling	@	.40	.40	
Carry forward			$2.92	$1,075.82

745 Brought forward				$1,075.82
Brought forward			$2.92	
1—2½" gate valve	@	$16.50	16.50	
1—¾" Chapman globe valve	@	5.50	5.50	
2—¼" globe valves	@	1.00	2.00	
1—½ pint lubricator	@	5.50	5.50	
Cutting, threading and erecting above piping	@	5.00	5.00	
				37.42
Steam, Exhaust & Miscellaneous Piping to Wet Vacuum Pump:				
22' 0"—1½" W. I. screw pipe	@	.10	2.20	
10' 0"—¾" " " "	@	.04	.40	
22' 0"—½" " " " ex. hvy	@	.03	.66	
2—1½" elbows	@	.07	.14	
1—¾" "	@	.03	.03	
8—½" " , extra heavy	@	.02	.16	
1—1½" flanged union	@	.75	.75	
1—¾" union	@	.10	.10	
2—½" " , extra heavy	@	.10	.20	
1—½" flanged coupling, ex. hvy	@	.50	.50	
1—¾" tee	@	.04	.04	
1—2" x ¾" bushing	@	.13	.13	
1—1½" check valve	@	3.50	3.50	
3—½" globe valves	@	1.00	3.00	
1—½" oil cup	@	.50	.50	
Cutting, threading and erecting above piping	@	6.00	6.00	
				18.31

The Water Supply.—Continued.

Steam, Exhaust & Miscellaneous Piping to Dry Vacuum Pump:

7′ 0″—1¼″ W. I. screw pipe	@	.07	.49	
13′ 0″—1″ " " " , ex. hvy	@@	.06	.78	
1—1¼″ elbow	@@	.06	.06	
2—1″ elbows, extra heavy	@@	.04	.08	
1—1¼″ flanged coupling	@@	.60	.60	
1—1″ " " , ex. hvy	@@	.45	.45	
1—3″ x 1¼″ bushing	@@	.25	.25	
Cutting, threading and erecting above piping	@	3.00	3.00	
				5.71
Carry forward				$1,137.26

746

Brought forward				$1,137.26

Steam, Exhaust & Miscellaneous Piping to Jacket Pump:

8′ 0″—1″ W. I. screw pipe	@	$.06	$.48	
33′ 0″—½″ " " " ex. hvy	@@	.03	.99	
1—1″ elbow	@@	.04	.04	
5—½″ " , extra heavy	@@	.02	.10	
1—1″ union	@@	.10	.10	
1—½″ " " "	@@	.07	.07	
2—1″ flanged couplings	@@	.45	.90	
1—1″ check valve	@@	1.55	1.55	
Cutting, threading and erecting above piping	@	2.50	2.50	
				6.73

Exhaust Piping to Air Pumps:					
4′ 0″—1½″ W. I. screw pipe	@	.10	.40		
9′ 0″—1¼″ " " "	@@	.07	.63		
1—1½″ tee	@@	.10	.10		
3—1¼″ elbows	@@	.06	.18		
1—2″ x 1½″ bushing	@@	.05	.05		
2—1½″ x 1¼″ "	@@	.02	.04		
Cutting, threading and erecting above piping	@	2.00	2.00		
					3.40
Miscellaneous Steam and Exhaust Piping:					
15′ 0″—1¼″ W. I. screw pipe	@	.06	.90		
65′ 0″—1″ " " "	@@	.04	2.60		
32′ 0″—¾″ " " "	@@	.03	.96		
6″—¼″ " " "	@@	.02	.12		
2—¼″ tees	@@	.07	.14		
1—1″ tees	@@	.05	.05		
1—¾″ tee	@@	.04	.04		
1—1¼″ elbow	@@	.05	.05		
4—1″ "	@@	.04	.16		
8—¾″ "	@@	.03	.24		
1—¼″ "	@@	.02	.02		
1—1¼″ union	@@	.14	.14		
3—1″ flanged unions	@	.38	1.14		
Carry forward			$6.56		$1,147.39

Brought forward				$1,147.39
Brought forward			$6.56	
1—1″ union	@	$.10	.10	
5—¾″ “	@	.08	.40	
8—1″ 45° bends	@	.06	.48	
5—¾″ “ “	@	.05	.25	
2—2½″ x 1″ bushing	@	.10	.20	
1—1¼″ x ¾″ “	@	.04	.04	
1—1¼″ x 1″ “	@	.02	.02	
1—1″ x ¾″ “	@	.02	.02	
1—¾″ safety valve	@	1.25	1.25	
1—¼″ pet cock	@	1.00	1.00	
2—1″ Chapman globe valves	@	6.00	12.00	
1—¾″ globe valve	@	1.25	1.25	
1—¾″ “ “ outside packed	@	1.25	1.25	
1—McDaniel's Pressure Trap	@	25.00	25.00	
1—#2 Wright “ “	@	27.00	27.00	
Cutting, threading and erecting above piping	@	15.00	15.00	
				91.82
Radiator in Engine Room:				
400′ 0″—1″ W. I. screw pipe, ex. hvy	@	.06	24.00	
19—1″ return bends	@	.26	4.94	
3—1″ tees	@	.05	.15	
2—1″ elbows	@	.04	.08	
2—1″ unions	@	.12	.24	
1—1½″ x 1″ bushing	@	.03	.03	
1—1″ globe valve—Chapman outside packed	@	6.00	6.00	

1—#3 Wright steam trap	@	21.00	21.00		
1—6" Ashcroft steam gauge and siphon	@	15.00	15.00		
Cutting, threading and erecting above piping	@	30.00	30.00		
					101.44

(*d*) Miscellaneous Drain Piping and Vents in Station.

32′ 0"—8" W. I. screw pipe	@	.82	26.24		
8′ 0"—5" " " "	@	.38	3.04		
28′ 0"—4" " " " in 5′ trench	@	.60	16.80		
55′ 0"—3" " " " extra heavy	@	.25	13.75		
10′ 0"—2" " " " in 2′ trench	@	.20	2.00		
20′ 0"—1" " " "	@	.04	.80		
20′ 0"—¾" " " "	@	.03	.60		
25′ 0"—½" " " "	@	.02	.50		
Carry forward			$63.73	$1,340.65	
748 Brought forward				$1,340.65	
Brought forward			$63.73		
1—5" elbow	@	$.63	.63		
1—4" "	@	.38	.38		
3—3" " extra heavy	@	.27	.81		
2—2" "	@	.09	.18		
2—1" "	@	.04	.08		
3—½" "	@	.02	.06		
1—4" tee	@	.55	.55		
2—3" " extra heavy	@	.39	.78		
2—2" "	@	.13	.26		

The Water Supply.—Continued.

2—1″ tee	@	.05	.10	
1—3″ flanged union, extra heavy	@	1.25	1.25	
2—2″ " "	@	.71	1.42	
1—1″ " "	@	.38	.38	
1—3″ plug	@	.07	.07	
1—2″ "	@	.03	.03	
1—4″ x 2″ bushing	@	.43	.43	
1—8″ Lyman Iron exhaust head	@	25.00	25.00	
1—3″ " " " "	@	7.50	7.50	
1—2″ gate valve	@	3.00	3.00	
1—1″ globe valve	@	1.50	1.50	
1—8″ McCarthy exhaust relief valve	@	75.00	75.00	
28′ 0″—4″ vitrified tile	@	.15	4.20	
168′ 0″—5″ " "	@	.25	42.00	
10—5″ " " tees	@	1.00	10.00	
37′ 0″—6″ " "	@	.25	9.25	
Cutting, threading and erecting above piping	@	50.00	50.00	
				298.59
Total Item No. 19				$1,639.24
Depreciation:				
Ave. age 9 yrs. Ave. life 30 yrs. Int. rate 4%. Annual Depreciation @ 1.714% = $28.10.				
Accrued Depreciation @ 18.9%				309.82
Net physical value				$1,329.42

Item No. 20. Piping in Station Yard.

Pump Suctions:

77′ 0″—10″ C. I. H. & S. pipe, weight 2.42 tons	@	$25.90	$62.68	
Laying 77′ 0″ 10″ C. I. H. & S. pipe in 4 ft. trench	@	.45	36.45	
1 10″ x 10″ x 10″ tee.				
1 12″ x 12″ x 12″ "Y", one branch flanged.				
1 10″ elbow, H. & S.				
2 12″ x 10″ reducer, H. & S.				
Weight of above specials = 2,000#	@	.04	80.00	
1 10″ gate valve, set	@	31.00	31.00	
				$210.13

Pump Discharges:

42′—10″ C. I. flange pipe, weighing 2.12 tons	@	100.00	212.00	
167′—10″ C. I. H. & S. pipe, weighing 8.46 tons in 3′ trench	@	1.50	250.50	
1 10″ flange and hub ell.				
1 10″ x 10″ x 10″ C. I. "Y" branch.				
1 10″ C. I. blank flange.				
1 10″ " " H. & S. 45° bend.				
2 10″ " " flanged 90° bends.				
1 8″ " " H. & S. " "				
1 10″ x 8″ C. I. H. & S. reducer.				
1 10″ C. I. H. & S. tee.				
1 10″ x 10″ x 10″ C. I. H. & S. "Y" branch.				
1 air chamber consisting of 1 10″ x 20″ flanged increaser, 13′ 0″—20″ flanged pipe, and 1 20″ flanged cap.				
Weight of above specials = 9,220#	@	.04½	414.90	
2 10″ Eddy gate valves, set	@	31.00	62.00	
				939.40

The Water Supply.—Continued.

Connection from Spring No. 22:				
101′—6″ C. I. H. & S. pipe, weighing 1.67 tons in 3′ trench	@	.80	80.80	
1 10″ x 8″ reducer.				
1 8″ x 6″ "				
1 6″ 90° bend.				
1 6″ x 6″ x 6″ tee.				
Weight of above specials = 684#	@	.03	20.52	
Carry forward			$101.32	$1,149.53
750 Brought forward				$1,149.53
Brought forward			$101.32	
1 6″ check valve, set	@	$15.60	15.60	
2 6″ gate valves, set	@	13.60	27.20	
				144.12
Blow-off from Spring Line to Creek:				
32′ 0″—5″ W. I. screw pipe in 3′ trench	@	.55	17.60	17.80
Blow-off from Boilers:				
28′ 0″—5″ W. I. extra heavy screw pipe in 3′ trench	@	.70	19.60	19.60
Blow-off from Secondary Heater to Creek:				
40′ 0″—1″ W. I. screw pipe, galvanized	@	.15	6.00	6.00

Drain from Worthington Pit to Creek:				
37′ 0″—6″ vitrified tile in 4′ trench	@	.30	11.10	11.10
Total Item No. 20				$1,347.95
Depreciation:				
Ave. age 10 yrs. Ave. life 50 yrs. Int. rate 4%. Annual depreciation @ .63% = $8.49.				
Accrued depreciation @ 7.9%				106.49
Net physical valve				$1,241.46
Item No. 21. Concrete Retaining Wall—Wall Lift.				
140 cu. yds. concrete (forms required)	@	8.00	1,120.00	
350 " " earth fill behind wall	@	.50	175.00	
				1,295.00
Total Item No. 21				$1,295.00
Depreciation:				
Ave age 8 yrs. Ave. life 50 yrs. Int. rate 4% Annual Depreciation @ .63% = $8.16.				
Accrued depriciation @ 6.03%				78.09
Net physical valve				$1,216.91

The Water Supply.—Continued.

751 Item No. 22. Station Yard Improvements.

1,080 cu. yds. solid side hill rock excavation crushed and used for concrete in building foundation	@	$3.00	$3,240.00	
565 cu. yds, earth fill on lower side of station site, borrowed to make up deficiency not furnished by excavation	@	.75	423.75	
200 lin. ft. woven wire fence 4′ 6″ high	@	.05	10.00	
24 4″ x 4″ x 8′ 0″ locust, oak and poplar posts	@	.40	9.60	
170 lin. ft. of log retaining wall along the river, 3′ high, made of 4 or 5 logs piled up with short tie logs running into bank 6′ to 8′, spand 5′ to 10′ apart	@	.75	127.50	
210 cu. yds. earth and loose rock fill at coal chute	@	.50	105.00	
				$3,915.85
Total Item No. 22				$3,915.85
Depreciation:				
Ave. age 8 yrs. Ave. life 50 yrs. Int. rate 4%. Annual Depreciation @ .63% = $24.67.				
Accrued Depreciation @ 6.03%				236.13
Net physical value				$3,679.72

Item No. 23. Station Miscellaneous.

	Radiator Frame:				
	3 wood standards supporting heating coil	@	$1.00	$3.00	
	44 bd. ft. 3′ x 6′ & 2″ x 4″ dressed poplar	@	50.00	2.20	
	60 C. I. pipe hangers	@	.25	15.00	
					$20.20
	Carry forward				$20.20
752	Brought forward				$20.20
	Pump:				
	1 Weinman double acting, single cylinder pump 6″ x 3¾″ x 8″, purchased in 1907 and used only during construction of twin tanks	@	$75.00	$75.00	75.00
	Boiler:				
	1 Erie City "Economic" boiler 80 H. P., contains 42—4″ flues, 5′0″ long and 76—3½″ flues, 10′ 0″ long. It is fitted with 1—4″ angle valve, 1—4″ globe valve, 1 water column and 1—2″ safety valve. Purchased in 1900 and removed in 1907 when the Sterling boilers were placed in fair repair	@	800.00	800.00	800.00
	Table:				
	1 office table with 4 drawers, 4′ 4″ x 3′ 0″ top, built of dressed oak	@	15.00	15.00	15.00
	Pictures and Frames:				
	5 frames and glasses on engine plans averaging 26″ x 38″	@	1.00	5.00	5.00

The Water Supply.—Continued.

Coal Scales:				
1 Fairbanks Morse "Standard No. 4" scale in pit	@	65.00	65.00	
4 cu. yds. earth excavation for pit	@	.50	2.00	
4 cu. yds. concrete in 8" walls 4' 0" high and in floor of pit	@	10.00	40.00	
				107.00
Coal Wagon:				
1 No. 2 light pattern charging barrow	@	33.00	33.00	33.00
Carry forward				$1,055.20
753 Brought forward				$1,055.20
Oil Filter:				
1 No. 3 Cross oil filter	@	$40.00	$40.00	40.00
Pit to Cavern Under Station:				
4 cu. yds. rock excavation	@	4.00	16.00	
2160 common red brick in Portland cement mortar	@	18.00	38.88	
18 bd. ft. 2" oak plank	@	60.00	1.08	
				55.96
Pit for Snow Auxiliaries:				
51 cu. yds. earth excavation	@	.50	25.50	
6½ " concrete in 10" walls 9' 2" high	@	9.00	58.50	
256 sq. ft. 8" concrete floor	@	.20	51.20	
				135.20
Iron Spiral Stairway in Auxiliary Pit:				
4½ ft. in diameter, 8' high with hand rail	@	100.00	100.00	100.00

Board Walk over Auxiliary Pit:				
35 bd. ft. ¾" tongue and groove pine	@	50.00	1.75	
52 " 2" x 6" pine S48	@	50.00	2.60	
				4.35
Hangers for Pipes:				
135 lbs. 1" round rods with 3 turnbuckles	@	.06	8.10	
25 lbs ½" round rods with 4 turnbuckles	@	.06	1.50	
				9.60
Total Item No. 23				$1,400.31
Depreciation:				
Ave. age 11 yrs. Ave. life 25 yrs. Int. rate 4%. Annual Depreciation @ 2.31% = $32.35.				
Accrued Depreciation @ 32.4%				453.70
Net physical value				$946.61

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Item No. 24. The Beaver Pond Station Building.

Area of floor = 1,313 sq. ft.
Cubic contents, outside dimensions from bottom of sills to average height of roof = 26,566 cu. ft.

(1) Foundation:				
4 cu. yds. Portland cement rubble masonry piers	@	$10.00	$40.00	$40.00

The Water Supply.—Continued.

(2) Walls and Framing:				
1,734 bd. ft. oak in sills, joists, posts, etc.	@	50.00	86.70	
2,553 bd. ft. 1″ oak sheathing on walls	@	55.00	140.41	
285 sq. yds. building paper	@	.03	8.55	
285 " #23 gauge corrugated galv. iron	@	.90	256.50	
				492.16
(3) Lumber in Roof:				
2,015 sq. ft. of ⅞″ dressed pine tongue and groove flooring for sheathing.	@	50.00	100.75	
1,856 bd. ft. rough oak lumber in rafters and bracing	@	50.00	92.80	
237 bd. ft. trim at eaves, dressed yellow pine painted two coats	@	55.00	13.03	
				206.58
(4) Roofing:				
225 sq. yds. Carey patented roofing (tarred paper and cloth)	@	.40	90.00	90.00
(5) Doors and Windows:				
All doors, sashes and frames are of yellow pine, painted two coats.				
4 double sash windows—one sash fixed, one sliding. Each sash 34″ x 36″, with 6—10″ x 16″ lights	@	7.50	30.00	
Carry forward			$30.00	$828.74
755 Brought forward				$828.74
Brought forward			$30.00	
3 double sash windows—one sash fixed, one sliding, each sash 28″ x 32″, with 4—10 x 14″ lights	@	$6.00	18.00	
2 doors 3′ 0″ x 7′ 0″, made of 2 layers of tongue and groove ⅞″ yellow pine flooring	@	10.00	20.00	
				68.00

(6) Coal Bin:

(6) Coal Bin:				
1,251 bd. ft. rough oak in joists, siding and flooring	@	50.00	62.55	62.55
(7) Painting:				
All doors, windows and trim at eaves painted two coats	@	25.00	25.00	25.00
Total Item No. 24				$984.29
Depreciation:				
Ave. age 4 yrs. Ave. life 15 yrs. Int. rate 4%. Annual Depreciation @ 4.8% = $47.25.				
Accrued Depreciation @ 21.8%				214.58
Net Physical Value				$769.71
Item No. 25. Steel Stack and Breeching.				
(*a*) Stack.				
3,200 lbs. No. 10 steel in stack and breeching	@	$.06	$192.00	$192.00
(*b*) Anchors.				
6 cu. yds. excavation for tie rods	@	.50	3.00	
2 " concrete for tie anchors	@	10.00	20.00	
4—1" anchor rods with eye, 6' 0" long and plate 1' 0" x 1' 0" x ½"	@	1.50	1.50	
330 lin. ft. ⅜" woven wire rope for bracing	@	.05	16.50	
Carry forward			$41.00	$192.00

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The Water Supply.—Continued.

756	Brought forward			$192.00
	Brought forward		$41.00	
380 lin. ft. 3/8" twisted wire rope for bracing (6 strand)	@	$ .05	19.00	
Stack and breeching painted	@	7.50	7.50	
				67.50
	Total Item No. 25			$259.50
	Depreciation:			
	Ave. age 4 yrs. Ave. life 15 yrs. Int. rate 4%. Annual Depreciation @ 4.8% = $12.46.			
	Accrued Depreciation @ 21.8%			56.57
	Net physical value			$202.93

Item No. 26. Worthington Pump.

1 duplex, double acting, horizontal steam pump, size 20" x 10¼" x 10". Plungers cut down to 9". Operates under 100# steam pressure against 350' head. Capacity 1 million gallons per day				$750.00
	Foundation:			
5 cu. yds. earth excavation	@	$ .50	$2.50	
4 " " stone masonry laid in Portland cement	@	8.00	32.00	

1—6′ 0″ x 3′ 4″ x ½″ iron plate bolted on top of foundation with 4—1″ anchor bolts 12″ long	@	16.00	16.00	
				50.50
Total Item No. 26				$800.50
Depreciation:				
Age 23 yrs. Life 35 yrs. Int. rate 4%. Annual Depreciation @ 1.31% = $10.49.				
Accrued Depreciation @ 49.8%				398.65
Net physical value				$401.85

757

Item No. 27. Feed Water Heater.

Feed water heater 4′ 6″ high x 20″ diameter	@	$75.00	$75.00	
140# C. I. in legs	@	.04	5.60	
1 cu. yd. excavation for foundation	@	.50	.50	
1 " " Portland cement concrete in foundation	@	12.00	12.00	
				$93.10
Total Item No. 27				$93.10
Depreciation:				
Age 23 yrs. Life 35 yrs. Int. rate 4%. Annual Depreciation @ 1.31% = $1.22				
Accrued Depreciation @ 49.8%				46.36
Net physical value				$46.74

The Water Supply.—Continued.

Item No. 28. Boiler Plant.

(*a*) 80 H. P. Boiler.

Boiler made by the Erie City Iron Works. 80 H. P., horizontal tubular boiler, 54″ diameter and 15′ 0″ long, and containing 64—3″ tubes. The boiler is designed for a working pressure of 100 lbs. Boiler is complete with C. I. front, flues, grates, doors, etc.	@	$12.00	$960.00	
Fittings:				
1—2″ Lonegar pop safety valve	@	10.00	10.00	
1—6″ Ashcroft steam gauge with siphon and cock	@	15.00	15.00	
1—Combination #1 Wright improved water column with gauge glass and 3 cocks	@	20.00	20.00	
				1,005.00

(*b*) 100 H. P. Boiler.

Boiler made by the Erie City Iron Works, 100 H. P., horizontal, tubular boiler 60″ diameter and 16′ long, and containing 54—4″ tubes. The boiler is designed for a working pressure of 100 lbs. Boiler is complete with C. L. front, flues, grates, doors, etc.	@	$12.00	$1,200.00	
Carry forward				$1,005.00

758	Brought forward				$1,005.00
	Fittings:				
32—710	1—2½" Scott pop safety valve	@	30.00	30.00	
	1—6" Ashcroft steam gauge with siphon and cock	@	15.00	15.00	
	1—combination #1 Wright improved water column with gauge glass and 3 cocks	@	20.00	20.00	
					$1,265.00

(c) Micellaneous Piping on Both Boilers.

Water Columns, Whistles, etc.:				
8' 0"—1¼" W. I. screw pipe	@	.06	.48	
5' 0"—1" " " "	@	.04	.20	
2—1¼" elbows	@	.05	.10	
2—1" street elbows	@	.06	.12	
2—1¼" tees	@	.07	.14	
2—1" "	@	.05	.10	
1—1¼" union	@	.14	.14	
2—1" "	@	.10	.20	
1—1¼" x 1" bushing	@	.02	.02	
2—1" plugs	@	.01	.02	
1—1¼" globe valve	@	1.90	1.90	
1—1" " "	@	1.35	1.35	
Cutting, threading and erecting above piping	@	2.50	2.50	
				7.27

The Water Supply.—Continued.

Boiler Blow-off Pipes:

1′ 0″—2½″ W. I. screw pipe	@	.14	.14	
6′ 0″—2″ " " "	@	.09	.54	
1′ 0″—1¼″ " " "	@	.06	.06	
2′ 0″—1″ " " "	@	.04	.08	
6′ 0″—¾″ " " "	@	.03	.18	
Carry forward			$1.00	$2,277.27
759 Brought forward				$2,277.27
Brought forward			$1.00	
1—1¼″ x 1″ reducing coupling	@	$.03	.03	
1—1″ tee	@	.05	.05	
1—1″ street elbow	@	.06	.06	
1—1″ union	@	.10	.10	
1—1″ x ¾″ bushing	@	.02	.02	
1—¾″ elbow	@	.03	.03	
1—1″ globe valve	@	1.35	1.35	
1—¾″ " "	@	1.05	1.05	
Cutting, threading and erecting above piping	@	2.50	2.50	
				6.19

(*d*) Boiler Settlings.

40 cu. yds. excavation in trenches	@	.50	20.00	
36½ " Portland cement concrete	@	8.00	292.00	
19,000 No. 1 hard burned brick in lime mortar	@	17.00	323.00	

400 fire brick	@	30.00	12.00	
48 sq. ft. 8″ concrete floor in ash pit	@	.20	9.60	
380 lbs. C. I. in stiffeners	@	.03	11.40	
550 lbs. shaped steel in bracing	@	.05	27.50	
140 lbs. 7/8″ round wrought iron rods in bracing	@	.05	7.00	
				702.50
Total Item No. 28				$2,985.96
Depreciation:				
Ave. age 16 yrs. Ave. life 25 yrs. Int. rate 4%. Annual Depreciation @ 2.31% = $68.98.				
Accrued Depreciation @ 52.4%				1,564.64
Net physical value				$1,421.32

Item No. 29. All Piping in Station.

(*a*) Water Pipes.

1—1½″ tap in C. I. mains	@	$1.50	$1.50
46′ 6″—1½″ W. I. screw pipe	@	.07	3.25
46′ 0″—1¼″ " " "	@	.06	2.76
Carry forward			$7.51

The Water Supply.—Continued.

760	Brought forward			87.51	
1—1½″	tee	@	$.09	.09	
4—1¼″	tees	@	.07	.28	
1—1½″	elbow	@	.06	.06	
7—1¼″	"	@	.05	.35	
4—1¼″	union	@	.14	.56	
2—1¼″	plugs	@	.02	.04	
1—1½″ x 1¼″	bushing	@	.03	.03	
1—1½″	plug valve	@	5.20	5.20	
4—1¼″	Jenkins globe valve	@	1.90	7.60	
2—1¼″	check valve	@	1.00	2.00	
	Cutting, threading and erecting above piping	@	10.00	10.00	
					33.72

(*b*) Steam Pipes.

30′ 4″—4″	extra heavy W. I. screw pipe	@	.38	11.52	
4—4″	elbows	@	.44	1.76	
1—4″	tee	@	.63	.63	
5—4″	flange unions	@	1.70	8.50	
1—5″ x 4″	reducing bushing	@	.51	.51	
1—5″	angle valve	@	21.00	21.00	
4—4″	globe valve, extra heavy (Crane #23)	@	23.00	92.00	
30′ 6″—5″	W. I. screw pipe, extra hvy	@	.53	16.16	
4—5″	elbows	@	.63	2.52	
1—5″	flanged union	@	1.90	1.90	
1—5″ x 4″	reducing coupling	@	1.25	1.25	
1—5″ x 4″	reducing elbow	@	.73	.73	
	Cutting, threading and erecting above piping	@	25.00	25.00	
					183.48

(c) Miscellaneous Small Pipe in Station.

43' 6"—1½" W. I. screw pipe	@	.07	3.05	
6' 0"—½" " " "	@	.02	.12	
6—1½" unions	@	.17	1.02	
4—½" "	@	.07	.28	
1—1½" tee	@	.09	.09	
3—½" "	@	.03	.09	
Carry forward			$4.65	$217.20
761 Brought forward				$217.20
Brought forward			$4.65	
1—1½" elbow	@	$.06	.06	
4—½" "	@	.02	.08	
1—1½" x 1– reducer	@	.15	.15	
2—1" nipples	@	.02	.04	
1—1½" Lunkenheimer globe valve	@	2.60	2.60	
1—1½" Jenkins " "	@	2.60	2.60	
1—1½" " angle "	@	2.60	2.60	
4—½" " globe "	@	.75	3.00	
2—1" corporation cocks	@	1.00	2.00	
1—1¼" plug valve	@	4.50	4.50	
2—1¼" elbows	@	.05	.10	
1—1¼" union	@	.14	.14	
Cutting, threading and erecting above piping	@	10.00	10.00	
				32.52

The Water Supply.—Continued.

(*d*) Suction Line for Pump.

5′ 0—10″ C. I. H. & S. pipe weighing 390 lbs.	@	1.75	8.75	
4′ 0″—8″ C. I. H. & S. pipe weighing 230 lbs.	@	1.50	6.00	
1—10″ 22½° bend, H. & S.	..	....	....	
1—10″ x 8″ reducer "	..	....	....	
1—8″ tee "	..	....	....	
1—8″ plug	..	....	....	
Approximate weight of above specials = 750 lbs.	@	.03	22.50	37.25

(*e*) Discharge Line for Pump.

32′—8″ C. I. H. & S. pipe, weight 0.9 tons	@	1.50	48.00	
1—8″ C. I. 45° bend—flange and spigot	..	....	.....	
1—8″ " " " —H. & S.	..	....	.....	
1—8″ " 90° " "	..	....	.....	
1—8″ " tee "	..	....	.....	
1—8″ x 10″ increaser "	..	....	.....	
1—8″ plug	..	....	.....	
Weight of above specials = 1,030#	@	.03	30.90	
1—8″ flanged check valve, set	@	23.00	23.00	
1—8″ Eddy gate valve, set	@	20.80	20.80	122.70
Carry forward—Total Item No. 39				$409.67

762	Brought forward—Total Item No. 29			$409.67
	Depreciation:			
	Ave. age 15 yrs. Ave. life 30 yrs. Int. rate 4%.			
	Annual Depreciation @ 1.714% = $7.02.			
	Accrued Depreciation @ 35.7%			146.25
	Net physical value			$263.42

Item. No. 30. Intake and Pipe Line to Pumping Station.

60 bd. ft. 2″ rough oak lumber	@	$60.00	$3.60	
1 perforated iron plate 30″ x 30″ x ⅛″, weighing 32 lbs.	@	.10	3.20	
135′ 0″—10″ C. I. H. & S. pipe, weighing 4.5 tons	@	27.90	119.97	
Laying 135 lin. ft. 10″ C. I. H. & S. pipe in 3′ trench	@	.45	60.75	
1—10″ 22½° H. & S. bend, weighing 202 lbs.	@	.03	6.06	
1—10″ foot valve, set	@	45.00	45.00	
				$238.58
Total Item No. 30				$238.58
Depreciation:				
Ave. age 23 yrs. Ave. life 50 yrs. Int. rate 4%.				
Annual Depreciation @ .63% = $1.50.				
Accrued Depreciation @ 24.0%				57.26
Net physical value				$181.32

The Water Supply.—Continued.

Item No. 31. Station Miscellaneous.

1—1 pint lubricator	@	$7.50	$7.50	
1—revolution counter on pump	@	15.00	15.00	
				$22.50
Total Item No. 31				$22.50
Depreciation:				
Ave. age 15 yrs. Ave. life 30 yrs. Int. rate 4%. Annual Depreciation @ 1.714% = $0.39.				
Accrued Depreciation @ 33.7%				8.03
Net physical value				$14.47

762½ *The Distribution System.*

763 Item No. 32. Cast Iron Street Mains.

1,271.8 tons of 6" to 10" C. I. H. & S. pipe	@	$25.40	$32,303.72	
392.5 tons of 3" and 4" C. I. H. & S. pipe	@	27.05	10,617.13	
2.5 tons of 4" C. I. H. & S. hydrant pipe	@	27.05	67.62	
				$43,988.47
				$43,988.47

Depreciation:

Ave. age 12 yrs. Ave. life 92 yrs. Int. rate 4%.
Annual Depreciation @ .107% = $47.07.

Accrued Depreciation @ 1.67%			734.61
Net physical value			$43,253.86

Item. No. 33. Cast Iron Specials in Street Mains.

32.11 tons of C. I. specials in street mains	@ 60.00	1,926.60	1,926.60

Depreciation:

Ave. age 12 yrs. Ave. life 92 yrs. Int. rate 4%.
Annual Depreciation @ .107% = $2.06.

Accrued Depreciation @ 1.67%			32.17
Net physical value			$1,894.43

The Water Supply.—Continued.

Item No. 34. Laying Cast Iron Street Mains.

Ordinary trenching including excavation, laying, yarn, lead and backfill. All pipes have 2 ft. cover, or depth of trench = 2½ ft.

15,350	lin. ft.	10"	C. I. pipe	@	$.28	4,298.00
11,840	"	8"	" "	@	.24	2,641.60
31,475	"	6"	" "	@	.20	6,295.00
28,336	"	4"	" "	@	.16	4,533.76
10,495	"	3"	" "	@	.15	1,574.25
225	"	4"	" hydrant pipe	@	.16	36.00
						19,578.61
			Carry forward—Total Item No. 34			$19,578.61
764			Brought forward—Total Item No. 34			$19,578.61
			Depreciation:			
			Ave. age 12 yrs. Ave. life 92 yrs. Int. rate 4%. Annual Depreciation @ .107% = $20.95.			
			Accrued Depreciation @ 1.67%			326.96
			Net physical value			$19,251.65

Item No. 35. Galvanized Iron Street Mains.

220	lin. ft.	2½"	galv. iron pipe	@	$.25	$55.00
2,950	"	2"	" "	@	.18	531.00

31,055	"	1½"	"	"	"	.....	@	.13	4,037.15	
19,615	"	1¼"	"	"	"	.....	@	.11	2,157.65	
4,470	"	1"	"	"	"	.....	@	.08	357.60	
7,115	"	¾"	"	"	"	.....	@	.05	375.75	
4,060	"	½"	"	"	"	.....	@	.04	162.40	
										7,676.55
Total Item No. 35										$7,676.55

Depreciation:

Ave. age 12 yrs. Ave. life 30 yrs. Int. rate 4%.
Annual Depreciation @ 1.71% = $131.27.

Accrued Depreciation @ 26.8%	2,057.32
Net physical value	$5,619.23

Item No. 36. Laying Galvanized Iron Street Mains.

Ordinary trenching including excavation, laying and backfill. Average depth of trench is 2 ft.

220	lin. ft.	2½"	galv.	iron	mains	.....	@	.14	30.80	
2,950	"	2"	"	"	"	.....	@	.13	383.50	
31,055	"	1½"	"	"	"	.....	@	.12	3,726.00	
19,615	"	1¼"	"	"	"	.....	@	.11	2,157.65	
4,470	"	1"	"	"	"	.....	@	.11	491.70	
7,115	"	¾"	"	"	"	.....	@	.10	711.50	
4,060	"	½"	"	"	"	.....	@	.10	406.00	
										$7,807.75
Carry forward										$7,907.75

The Water Supply.—Continued.

765	Brought forward—Total Item No. 36				$7,907.75
	Depreciation:				
	Ave. age 12 yrs. Ave. life 30 yrs. Int. rate 4%. Annual Depreciation @ 1.71% = $135.22.				
	Accrued Depreciation @ 26.8%				2,119.28
	Net physical value				$5,788.47

Item No. 37. Extra for Unusual Excavation.

Extra over and above ordinary excavation for trenches of an unusual character.

	Rock and Shale Trenches:				
1,285	cu. yds. solid rock excavation	@	$2.50	$3,212.50	
6,680	" shale excavation	@	1.00	6,680.00	
					$9,892.50
	Wet Trenches:				
1,830	lin. ft. of wet trench requiring constant pumping	@	.20	366.00	366.00
	Under Buildings:				
	Between Hardy Street and Roanoke street, the 4" line lies under two warehouses for a distance of 260 feet	@	5.00	5.00	5.00
	Total Item No. 37				$10,263.50

Depreciation:

Ave. age 12 yrs. Ave. life 92 yrs. Int. rate 4%.
Annual Depreciation @ .107% = $10.98.

Accrued Depreciation @ 1.67%		171.40
Net physical value		$10,092.10

Item No. 38. Steam Railroad Crossings.

Extra over and above the cost of ordinary trenching for pipe laid under the following railroad crossings.

766	Hardy Street near Roanoke Street:		
20 feet of 4" pipe in 5½ ft. trench under 1 track	@	$40.00	$40.00
	Pearis Street Crossing:		
212 feet of 8" pipe in 2 ft. to 8½ ft. trench under 9 tracks	@	200.00	200.00
	Thomas Street Crossing:		
220 feet of 4" main in 5 ft. trench (½ of which was solid rock) under 8 tracks	@	400.00	400.00
	Mercer Street Crossing:		
330 lin. ft. of 4" pipe in 5 ft. trench under 15 tracks and two masonry retaining walls 12 ft. thick at the base	@	425.00	425.00

The Water Supply.—Continued.

Logan Street Crossing:				
520 lin. ft. 6″ pipe in 5 ft. trench under 17 tracks	@	350.00	350.00	$1,415.00
Total Item No. 38				$1,415.00
Depreciation:				
Ave. age 12 yrs. Ave. life 92 yrs. Int. rate 4%. Annual Depreciation @ .107% = $1.51.				
Accrued Depreciation @ 1.67%				23.63
Net physical value				$1,391.37

Item No. 39. Street Railroad Crossings.

Extra over and above the cost of ordinary trenching for pipe laid under street railway tracks.

(*a*) Cast Iron Mains.

24 tracks crossed at right angle	@	$12.00	$288.00	
4 " " diagonally	@	17.00	68.00	
				356.00
Carry forward—Total (*a*)				$356.00

767	Brought forward—Total (*a*)			$356.00
	Depreciation:			
	Ave. age 12 yrs. Ave. life 92 yrs. Int. rate 4%. Annual Depreciation @ .107% = $0.38.			
	Accrued Depreciation @ 1.67%			5.95
	Net physical value			$350.05

(*b*) Galvanized Iron Mains.

4 tracks crossed at right angles	@ $12.00	$48.00	
2 " " diagonally	@ 17.00	34.00	
			82.00
Total (*b*)			$82.00
Depreciation:			
Ave. age 12 yrs. Ave. life 30 yrs. Int. rate 4%. Annual Depreciation @ 1.71% = $1.40.			
Accrued Depreciation @ 26.8%			21.98
Net physical value			$60.02

The Water Supply.—Continued.

Summary Item No. 39.

Cost of Reproduction				438.00
Annual Depreciation = $1.78.				
Accrued Depreciation				27.93
Net physical value				$410.07

Item No. 40. Cutting through Pavements over Mains.

Extra over and above the cost of ordinary trenching for cutting through pavements over mains.

(*a*) Cast Iron Mains.

19,965 lin. ft. of brick on 6" concrete base	@	$.70		$13,975.50
520 " " of granite on 6" base	@	.60		312.00
Carry forward				$14,287.50
Brought forward			$14,287.50	
6,490 lin. ft. of plain macadam pavement	@	$.15	973.50	
14,215 " " " 2" bitulithic macadam on 4" concrete base	@	.75	10,661.25	
3,730 lin. ft. of 8" water bound macadam	@	.20	746.00	
1,780 " " " parking	@	.10	178.00	
				$26,846.25
Total (*a*)				$26,846.25

Depreciation:

Ave. age 12 yrs. Ave. life 92 years. Int. rate 4%.
Annual Depreciation @ .107% = $28.72.

Accrued Depreciation	@	1.67%	.....	448.33
Net physical value				$26,397.92

(*b*) Galvanized Iron Mains.

835 lin. ft. of brick on 6" concrete base	@	$.70	$584.50	
925 " " " plain macadam	@	.14	138.75	
710 " " " 2" bitulithic macadam on 4" concrete base	@	.75	532.50	
25 lin. ft. of 8" water bound macadam	@	.20	5.00	
5,780 " " " parking	@	.10	578.00	
				$1,838.75
Total (*b*)				$1,838.75

Depreciation:

Ave. age 12 yrs. Ave. life 30 years. Int. rate 4%.
Annual Depreciation @ 1.71% = $31.44.

Accrued Depreciation	@	26.8%		492.78
Net physical value				$1,345.97

The Water Supply.—Continued.

Summary Item No. 40.

Cost of Reproduction			$28,685.00	
Annual Depreciation = $60.16.				
Accrued Depreciation			941.11	
Net physical value			$27,743.89	

769

Item No. 41. Valves on Mains.

6—10″ double gate valves	@	$27.00	$162.00	
23— 8″ " " "	@	18.90	434.70	
82— 6″ " " "	@	12.60	1,033.20	
63— 4″ " " "	@	7.65	481.95	
20— 3″ " " "	@	6.55	131.00	
1—8″ check valve	@	19.30	19.30	
1—6″ " "	@	12.80	12.80	
1—10″ Electro hydraulic gate valve	@	175.00	175.00	
1— 8″ " " gate valve	@	150.00	150.00	
1— 6″ " " " "	@	140.00	140.00	
199 valves distributed and set	@	2.00	398.00	$3,137.95
Total Item No. 41				$3,137.95

Depreciation:

Ave. age 12 yrs. Ave. life 50 yrs. Int. rate 4%.
Annual Depreciation @ .63% = $19.77.

Accrued Depreciation	@	9.8%	.....	307.52
Net physical value				$2,830.43

Item No. 42. Valve Boxes on Mains.

(*a*) Vaults for Electro-Hydraulic Valves.

(1) Cor. Pearis & Fourth Streets:

5 cu. yds. earth excavation	@	$.50	$2.50	
900 brick laid in cement mortar	@	20.00	18.00	
28 ft. 4″ x 4″ x 9.8# angles in roof weighing 274 lbs.	@	.05	13.70	
460 lbs. C. I. in frame and cover	@	.03	13.80	
15 ft. 4″ vitrified tile in 5′ trench	@	.40	6.00	
				$54.00

(2) Cor. Bland & Higginbotham Streets:

3 cu. yds. solid rock excavation	@	.50	1.50	
800 common red brick in cement mortar	@	20.00	16.00	
460 lbs. C. I. in cover and frame	@	.03	13.80	
				31.30
Carry forward				$85.30
770 Brought forward				$85.30

(3) On Princeton Ave., near Giles Street:

2½ cu. yds. earth excavation	@	$.50	$1.25	
820 common red brick in cement mortar	@	20.00	16.40	
460 lbs. C. I. cover and frame	@	.03	13.80	
20′—4″ vitrified tile in 3′ trench	@	.30	6.00	
				37.45

The Water Supply.—Continued.

(*b*) Cast Iron Valve Boxes.

188 C. I. valve boxes weighing 58 lbs., each, set	@	2.25	423.00	423.00
Total, Item No. 42				$545.75
Depreciation:				
Ave. age, 12 yrs. Ave. life, 50 yrs. Int. rate, 4%. Annual Depreciation @ .63%=$3.44.				
Accrued Depreciation @ 9.8%				53.48
Net physical value				$492.27

Item No. 43. Fire Hydrants.

15 4″ Eddy hydrants, 2 2½″ nozzles with barrel 3½ ft. long, distributed and set	@	$29.00	$435.00	$435.00
Depreciation:				
Ave. age, 12 yrs. Ave. life, 50 yrs. Int. rate, 4%. Annual Depreciation @ .63% = $2.74.				
Accrued Depreciation @ 9.8%				42.63
Net physical value				$392.37

1 6″ service consisting of 16′ of 6″ C. I. pipe, and 6″ gate valve in valve box	@	$29.00	$29.00	
3 4″ services each consisting of 16′ of 4″ C. I. pipe and 4″ gate valve in valve box	@	20.00	60.00	
2 3″ services, each consisting of 16′ of 3″ C. I. pipe and 3″ gate valve in curb box	@	16.50	33.00	
8 2″ services, each consisting of 16′ of 2″ galvanized pipe, corporation cock and gooseneck, curb cock and curb box	@	29.50	236.00	
3 1½″ services, each consisting of 16′ of 1½″ galvanized pipe, corporation cock and gooseneck, curb cock and curb box	@	20.00	60.00	
14 1″ services, each consisting of 16′ of 1″ galvanized pipe, corporation cock and gooseneck, curb cock and curb box	@	10.25	143.50	
2 3¾″ services, each consisting of 16′ of ¾″ galvanized pipe, corporation cock and gooseneck, curb cock and curb box	@	8.00	16.00	
1,564 ½″ services, each consisting of 16′ of ½″ galvanized pipe, corporation cock and gooseneck, curb cock and curb box	@	6.75	10,557.00	
637 ¼″ services, each consisting of 16′ of ½″ lead pipe, corporation cock, curb cock and curb box	@	8.00	5,096.00	
				$16,230.50

Unusual Excavation in Services:

Extra over and above the cost of ordinary trenching. Taken proportional to street mains, taking one service for every 75 feet.

Carry forward $16,230.50

The Water Supply.—Continued.

772	Brought forward				$16,230.50
275	cu. yds. solid rock excavation	@	$2.50	$687.50	
1,420	" shale excavation	@	1.00	1,420.00	
390	lin. ft. of wet trench	@	.20	78.00	
					2,185.50

Cutting through Pavement over Service Pipes:

Extra over and above the cost of ordinary trenching. Taken proportional to street mains, taking one service for every 75 feet of mains.

4,440	lin. ft. brick on 6" concrete base	@	.70	3,108.00	
110	" granite block on 6" concrete base	@	.60	66.00	
1,680	" plain macadam pavement	@	.15	252.00	
3,190	" 2" bitulithic macadam on 4" concrete base	@	.75	2,392.50	
800	" of 8" water bound macadam	@	.20	160.00	
					5,978.50
	Total Item No. 44				$24,394.50

Depreciation:

Ave. age 12 yrs. Ave. life 50 yrs. Int. rate 4%.
Annual Depreciation @ .63% = $153.69.

Accrued Depreciation @ 9.8%	2,390.66
Net physical value	$22,003.84

Item No. 45. Meters in Service.

1 4″ Gem	@	$100.00	100.00	
1 2″ Neptune (Compound)	@	45.00	45.00	
4 1″ Neptune	@	16.80	67.20	
6 2″ Nash	@	50.00	300.00	
1 1½″ Lambert	@	30.00	30.00	
1 ¾″ Neptune	@	12.40	12.40	
1 1″ Keystone	@	16.80	16.80	
179 ⅛″ Empire	@	12.40	2,219.60	
347 ½″ Neptune	@	7.30	2,533.10	
8 ½″ Crown	@	12.40	99.20	
1 1″ Lambert	@	12.40	12.40	
389 ½″ Niagara	@	6.00	2,334.00	
265 ½″ Keystone	@	8.40	2,226.00	
12 ½″ Hersey	@	12.40	148.80	
Carry forward			$10,144.50	
773 Brought forward			$10,144.50	
1—1″ Nash	@	$16.40	16.40	
100—½″ “	@	8.50	850.00	
1—½″ Standard	@	8.40	8.40	
149—½″ Gamon	@	7.20	1,072.80	
1,467 meters distributed and set	@	1.50	2,200.50	
				$14,292.60
Total Item No. 45				$14,292.60

The Water Supply.—Continued.

Depreciation:

Annual Depreciation @ 3.23% = $461.65.

Accrued Depreciation @ 25%				3,573.15
Net physical value				$10,719.45

Item No. 46. Meter Boxes and Vaults.

1,458 standard meter boxes, set	@	$4.50	$6,561.00	$6,561.00
1 meter box consisting of one joint of 18" vitrified tile with no bell, and a C. I. cover and ring weighing 65 lbs.	@	3.00	3.00	3.00
1 meter vault on gravity spring line, as follows:				
11 cu. yds. earth excavation	@	.50	5.50	
5 " concrete in walls and roof	@	20.00	100.00	
635 lbs. ¾" round rods	@	.03	19.05	
3 C. I. extra heavy meter box covers, approximate weight 100 lbs. each	@	3.00	9.00	
21 ft. 6" vit. tile in 3' trench	@	.30	6.30	
10' 0"—6" C. I. H. & S. pipe weighing 330 lbs	@	.50	5.00	
20' 0"—6" W. I. screw pipe	@	.50	10.00	
2—6" C. I. Y branches, weight 362 lbs.	@	.03	10.86	
2—6" C. I. 45° bends, weight 210 lbs.	@	.03	6.30	
12—6" x 2" C. I. tees for screw pipe	@	1.45	17.40	
6—2" companion flanges	@	1.00	6.00	
Carry forward			$195.41	$6,564.00

774 **Brought forward**			$195.41	$6,564.00
24—2″ elbows	@	$.09	2.16	
36—2″ nipples	@	.06	2.16	
2—6″ plugs	@	1.00	2.00	
3—6″ gate valves, set	@	13.60	40.80	
6—2″ fish traps	@	2.00	12.00	
				254.53
1 brick meter vault (N. & W. R. R. 6n Hardy St.):				
2 cu. yds. excavation (earth)	@	.50	1.00	
640 common red brick in cement mortar	@	20.00	12.80	
35 bd. ft. 2″ oak plank	@	60.00	2.10	
				15.90
1 brick meter vault (Matz Hotel):				
4 cu. yds. earth excavation	@	.50	2.00	
900 common red brick in cement mortar	@	20.00	18.00	
1 C. I. frame and cover, weighing 640 lbs.	@	.03	13.20	
				33.20
1 brick meter vault (Pocahontas Coal Company):				
2 cu. yds. earth excavation	@	.50	1.00	
450 common red brick in cement mortar	@	20.00	9.00	
1 C. I. frame and cover, weighing 600 lbs.	@	.03	18.00	
				28.00
434 meter boxes placed in concrete sidewalks	@	1.50	651.00	651.00
Total Item No. 46				$7,546.63

The Water Supply.—Continued.

Depreciation:

Ave. age 12 yrs. Ave. life 50 yrs. Int. rate 4%.
Annual Depreciation @ .63%=$47.54.

Accrued Depreciation @ 9.8%				739.57
Net physical value				$6,807.06

775 Item No. 47. Twin Tanks.

Excavation for Site of Tanks:

1,198 cu. yds. hard shale excavation	@	$1.00	$1,198.00	
1,765 " " " " (for future tanks)	@	1.00	1,765.00	
				$2,963.00

Foundation for 2 Tanks:

315 cu. yds. of concrete	@	7.00	2,205.00	2,205.00

Material in 2 Tanks:

486,000 lbs. steel in tanks	@	.05	24,300.00	
38,400 " " " roof trusses	@	.05	1,920.00	
5,500 bd. ft. of lumber in sheathing and purlins	@	50.00	275.00	
166 squares tar paper	@	1.50	249.00	
				26,744.00

Piping and Drains:				
Overflow Drain for 2 Tanks:				
88′ 0″—12″ vitrified tile, laid	@	.50	44.00	
2 12″ " " tees "	@	1.00	8.00	
				52.00
Overflow for 2 Tanks:				
122′ 0″—12″ C. I. flanged pipe, weighing 9,340 lbs.	@	.05	467.00	
2 12″ C. I. flanged elbows, weighing 580 lbs.	@	.05	29.00	
				496.00
Washout for 2 Tanks:				
28′ 0″—12″ C. I. flanged pipe, weighing 2,140 lbs.	@	.05	107.00	
2 12″ C. I. flanged elbows, weighing 580 lbs.	@	.05	29.00	
2 12″ C. I. flanged gate valves, set	@	38.00	76.00	
				212.00
Supply for 2 Tanks:				
30′ 0″—10″ C. I. flanged pipe, weighing 1,770 lbs.	@	.05	88.50	
Carry forward			$88.50	$32,672.00
776 Brought forward				$32,672.00
Brought forward			$88.50	
2 10″ C. I. flanged elbows.				
2 10″ " H. & S. "Y" branches.				
1 10″ " plug.				
Approximate weight of above specials=1,320 lbs.	@	$.04½	59.40	
2 10″ C. I. gate valves, set	@	29.00	58.00	
				205.90

Painting:				
31,400 sq. ft. of two coat painting	@	.02	628.00	628.00
Total for Item No. 47				$33,503.90
Depreciation:				
Ave. age 9 yrs. Ave. life 30 yrs. Int. rate 4%. Annual Depreciation @ 1.71%=$572.95.				
Accrued Depreciation @ 18.9%				6,332.62
Net physical value				$27,173.28
Item No. 48. Bland Street Tank.				
1,110 cu. yds. shale excavation	@	$1.00	$1,110.00	
180 " stone masonry in foundation	@@	7.00	1,260.00	
70,000 lbs. of steel in tank	@@	.05	3,500.00	
6 cu. yds. concrete in retaining walls	@	10.00	60.00	$5,930.00
Piping and Drains:				
Overflow and Drain:				
36′ 0″—10″ C. I. flanged pipe weighing 2,120 lbs	@	.05	106.00	
1 10″ C. I. flanged elbow, weighing 210 lbs	@	.05	10.50	
15′ 0″—12″ vit. tile in 2′ trench	@	.50	7.50	
220′ 0″—10″ " " " 2′ "	@	.40	88.00	212.00
Carry forward				$6,142.00

777	**Brought forward**				$6,142.00
	Piping:				
	278′ 0″—10″ C. I. H. & S. pipe weighing 8.88 tons	@	$27.40	$243.31	
	Laying 278′ of 10″ C. I. H. & S. pipe	@	.35	97.30	
	10′ 0″—12″ C. I. flanged pipe, weighing 764 lbs.	@	.05	38.20	
	330′ 0″—6″ C. I. H. & S. pipe weighing 5.5 tons	@	27.40	150.70	
	Laying 330′ of 6″ C. I. H. & S. pipe	@	.25	82.50	
	1 10″ x 12″ C. I. increaser.				
	2 10″ x 6″ " " tees.				
	1 10″ x 8″ " " "Y" branch.				
	1 12″ C. I. elbow.				
	5 6″ " " "				
	1 6″ " " " 45° bend.				
	Approximate weight of above specials = 2,522 lbs.	@	.03	75.66	
	3 10″ gate valve, set	@	29.00	87.00	
	2 6″ " " "	@	13.60	27.20	
					801.87
	Total Item No. 48				$6,943.87
	Depreciation:				
	Ave. age 23 yrs. Ave. life 30 yrs. Int. rate 4%.				
	Annual Depreciation @ 1.71% = $118.74.				
	Accrued Depreciation @ 65.3%				4,534.35
	Net physical value				$2,409.52

The Water Supply.—Continued.

Item No. 49. Electric Transmission Line.

55 30′ poles	@	5.00	275.00	
58 2 pin cross arms	@	.30	17.40	
130 pins	@	.10	13.00	
130 glass insulators	@	.07	9.10	
42 24″ galv. iron cross arm braces	@	.10	4.20	
510 lbs. No. 12 B. & S. gage copper clad wire	@	.25	127.50	
20 dry batteries	@	.35	7.00	
Labor erecting line	@	200.00	200.00	
				$653.20
Carry forward. Total Item No. 49				$653.20
778 Brought forward. Total Item No. 49				$653.20
Depreciation:				
Ave. age 2 yrs. Ave. life 25 yrs. Int. Rate 4%. Annual Depreciation @ 2.31% = $15.09.				
Accrued Depreciation @ 4.9%				32.01
Net physical value				$621.19

778½ *Miscellaneous.*

779 Item No. 50. Inventory of Laboratory Equipment.

Includes all apparatus and chemicals in the laboratory.

Present worth $250.00

Item No. 51. Inventory of Office Furnishings.

Includes all furnishings in the office building.

Present worth $1,100.00

Item No. 52. Inventory of Materials & Supplies.

Includes all tools, supplies, vehicles, pipe, etc., at the Ada Pumping Station, in the pipe yard and in the meter shop.

Present worth $8,100.00

Item No. 53. Cost of Engineering and Superintending.

These costs to begin with the surveys and preparations of such detailed plans as are finally agreed upon in the franchise requirements, and end with the completing and placing of the plant in operation.

It covers the following items:

(*a*) Salary and Expenses of Superintendent and Engineering Force.
(*b*) Preparation of Detailed Plans.
(*c*) Preparation of Specifications.
(*d*) Preparation and Letting of Contracts.
(*e*) Setting of Lines and Grades.
(*f*) Inspection of Work.
(*g*) Estimates of Contractor.
(*h*) Purchase of Material and Supervision of Labor where it is not contracted.
(*i*) Final Tests and Adjustment of Contracts.
(*j*) The placing of the Plant in Successful Operation.

780 And, in general, all the ordinary engineering, superintendence and technical management of the construction.

This item is taken at 5% of items Nos. 3 to 52 inclusive, and amounts to $22,395.00

Annual Depreciation = $150.00.

Accrued Depreciation 1,880.00

Net physical value $20,515.00

Item No. 54. General Administrative and Legal Costs.

Including the salaries and expenses of the Company's Officers, Accountants and Attorneys during the period of construction, commencing at the end of the time covered by Preliminary Costs, and continuing to the time when the plant is put in successful operation.

These costs include:

(*a*) Salaries of General Officers.
(*b*) Salaries and Expenses of Office Assistants.
(*c*) Cost of Accounting.
(*d*) Legal Advice.
(*e*) Rent and Office Expense.

This item is taken at 2% of items Nos. 3 to 52 inclusive, and amounts to..... $8,960.00

Annual Depreciation = $60.00.

Accrued Depreciation 755.00

Net physical value..... $8,205.00

781 Item No. 55. General Contingent Costs During Construction.

Being all costs growing out of omissions or unforeseen changes or events during construction.

This item includes:

(*a*) Changes in Construction due to Unforeseen Obstacles developed during the Progress of the Work.
(*b*) Rise in Prices of Material or Labor above Normal.
(*c*) Financial Panics.
(*d*) Inclement Weather causing Delays.
(*e*) Floods causing both an Actual Property Loss and Unavoidable Delays.
(*f*) Failure of Contractors.
(*g*) Especial Unforeseen Difficulties encountered in deep Excavations.
(*h*) Strikes.
(*i*) Litigations.
(*j*) Taxes and Assessments on Real Estate and Personal Property for One Year.
(*k*) Insurance.

And, in general, all costs which experience has shown must be allowed for by a prudent man engaging in a large constructive enterprise over and above that which can be specifically enumerated.

This item is taken at 4% of items Nos. 3 to 52 inclusive, and amounts to	$17,920.00
Annual Depreciation = $120.00	1,505.00
Net physical value	$16,415.00

Item No. 56. Interest During the Construction Period.

The interest lost during construction due to the withdrawal of funds from channels where they are earning return and placing them in a "building" property which cannot earn until
782 ready to operate is composed of the losses from:

1st. Moneys invested in real estate.
2nd. Moneys invested in the property other than real estate.

Interest on Real Estate Investment:

The money expended for real estate must necessarily be available early in the construction period, as one of the first steps after the preliminary studies have been made and the source of water supply and character of its development decided upon, is to purchase the necessary real estate; consequently the money expended for real estate is placed in a non-productive investment until the plant begins to operate.

Interest on Property Other Than Real Estate:

The interest lost due to investment in the property other than real estate depends upon the order of construction or the rate at which the construction requires money and the length of time it lies unproductive. In this case it is assumed that the physical plant would be built in one year, so that operation would begin January 1st, 1916.

Order of Construction:

783 I have, therefore, developed a program of construction which would logically be followed in duplicating the properties of the Bluefield Water Works & Improvement Company. It is assumed that the plant would be first thought of on January 1st, 1915, (the date of this valuation) and definite steps toward a water works taken at that time.

Engineering advice would be called to report upon the most practicable methods of supplying the city with an adequate amount of pure water. The report would show the relative first and annual costs of the several plans considered in such a manner to enable investors to judge as to the best procedure. The plan having been selected, the project would be financed, passage of necessary franchises secured and detailed plans drawn up. This would require at least four months so that it would be May 1st before contracts could be

advertised and let. By this time the necessary real estate would be purchased.

Construction on the springs and pipe lines to the city would be started immediately and it is estimated that this work would progress uniformly until completion late in the year. The work on the distribution system and pumping stations would begin in June.

784 As soon as the progress on the station buildings would permit, the machinery could be installed, and it is considered that the work on pipe system and tanks, as well as the installation of pumps, boilers and piping would be completed late in December, so that the entire plant would be thrown into operation on January 1st, 1916.

Many consumers would attach services to the mains as they were laid and when the plant began to operate, 500 would be ready to take water. The remainder would connect rapidly as shown in Table No. 3, Item No. 57, following. It is assumed that on January 1st, 1920, the new plant will be identical with the existing plant both in physical structure and earnings.

Table "A" shows the investment in the several parts of the physical plant.

TABLE "A."

Investment in Comparative Plant.

Preliminary Cost	$14,455
Real Estate, Improvements and Rights of Way	33,984
Water Supply	161,940
Pumping Station	49,980
Distribution system including tanks	188,893
Miscellaneous Equipment and Supplies	9,450
Engineering, Legal Costs and Contingencies	45,135
Total Amount of Investment	$503,817

785 The amounts in this table are the estimated present worth of the various parts of the physical plant. Interest during construction and going value have yet to be computed.

In Table "B" is shown the interest lost during the construction of the properties of the Bluefield Water Works and Improvement Company, based directly upon the assumption made as to the order of construction as outlined above, and on the further assumption that the dividing line for the charges for loss of interest on construction account and on operating account is drawn at the point of completion and putting into operation of the plant on January 1st, 1916.

TABLE "B."

Date, December 31, 1915.

Total amount expended during year (Net Physical Value, exclusive of Going Value and Interest Lost During Construction)		$503,817
Average amount on which interest is chargeable to capital account for one full year	$251,908	
Interest on $251,908 @ 6%		15,114
Total amount expended (Net Physical Value and Interest During Construction, Exclusive of Going Value)		$518,931

786 Item No. 57. Going Concern Value.

Going value may be defined as "The Cost of Financing a Physical Plant into the Possession of an Adequate Income."

The computation of the amount of "going value" possessed by a given plant involves the recreation of the income of the existing plant; starting at the date of the valuation of the property, the appraiser must carry through the financial transaction involved in planning and construction a plant duplicating the present plant in every way, including its ability to earn a fair rate of return by reason of its being an established and "going" property. It has not only the ability to earn, but actually has consumers and is earning, thus having an added value over a new plant identical physically, but just completed and with no consumers.

It is perfectly obvious that any thinking investor would prefer to own, and be willing to pay more for the going plant than for the newly completed plant without a business. The question is, how shall that added value be measured? If the value of the plant is measured by the cost of duplication less depreciation, why not measure the value of the developed business by the cost of reproducing that business in a way humanly possible? This method of
787 computation has been accepted by the courts and numerous appraisal boards, and has been followed in this report.

A more detailed discussion of going value is included in the report preceding the reproduction estimates.

TABLE NO. 1.

General Statistics Relating to the Bluefield Water Works and Improvement Company.

	Year ending.	
	Dec. 31, 1914.	Dec. 31, 1920.
Population Served	14,500	18,800
Live Services	2,234	3,100
Consumption (Annual Million Gallons)	317	435
Gross Income	$39,802	$47,000
" " per tap	17.85	15.20
" " " million gallons	126.00	108.00
Gross Income, exclusive Hydrant Rentals	$36,660	$43,500
Gross Income, exclusive Hydrant Rentals per tap	16.50	14.05
Gross Income, exclusive Hydrant Rentals per M. G.	116.00	100.00
Cost of Operation Exclusive of Fixed Charges and Depreciation	$19,973	$25,000
Per Tap	8.95	8.05
Per million gallons	63.20	57.50
Per cent of gross income	50.1	53.1
Net Income exclusive of Fixed Charges and Depreciation	$19,829	$22,000
Per Tap	8.90	7.15
" million gallons	62.80	50.50
" cent of gross income	49.9	46.9
Hydrant Rental	$3,142	$3,500

(Here follows diagram marked page 788.)

789 The cost of reproducing the physical property of the Bluefield Water Works and Improvement Company has been found herein to be $503,817. To this amount has been added $15,114 for "Lost Interest During Construction" as computed in Item No. 56.

Going Value Computations:

Date of valuation, January 1st, 1915.

The physical plant was inventoried as of January 1st, 1915, and the values of the separate parts determined as outlined in the report under "Unit Prices."

Construction and Going Value Development Periods:

It is assumed that at least one year, or until January 1st, 1916, would be required to build a new comparative plant identical, physically, with the existing plant as of January 1st, 1915. It is further assumed that five years, or four years in addition to the construction period would be the least possible time required by the comparative plant to develop an income identical with that of the existing plant.

Operations of Existing Plant:

In Table No. 2 are shown the forecasted operating statistics of the existing plant during the construction and going value development periods of the comparative plant. This forecast is based upon a careful study of the past growth in income and expenses of operation of the water works property.

790 TABLE No. 2.

Existing Plant.

Annual Income and Operating Expense.

Year ending Dec. 31st.	Gross income.	Operation, maintenance, and taxes.	Net income exclusive of depreciation and fixed charges.	Depreciation.	Net income applicable to fixed charges & dividends.
1915.....	$41,000	$20,800	$20,200	$5,150	$15,050
1916.....	42,200	21,640	20,560	5,250	15,310
1917.....	43,400	22,480	20,920	5,350	15,570
1918.....	44,600	23,320	21,280	5,450	15,830
1919.....	45,800	24,160	21,640	5,550	16,090
1920.....	47,000	25,000	22,000	5,650	16,350

Operations of Comparative Plant:

The largest consumers will be the first to avail themselves of the use of pure water under pressure, and the consumption per consumer will, therefore, be high during the early years of operation. The revenue per million gallons will be low at first, as the largest consumers pay the lowest rate.

During the past year the twenty-five largest consumers used over thirty-three million gallons of water, and paid $6,594 revenue to the Water Company at an average rate of $196 per million gallons of water actually metered to them. They paid an average annual revenue of $264 each.

The remaining small consumers paid an average of $13.80 each, and the average for all the consumers was $16.50. The aver-
791 age rate paid for all the water pumped in 1914 was $116.00 per million gallons. This rate is low on account of being based on the gross pumpage which includes slip of pumps, leaks in mains, waste and other water unaccounted for.

The following table shows the estimated domestic income of the comparative plant.

TABLE NO. 3.

Domestic Income of Comparative Plant.

Period.	No. of consumers.	Rate per consumer.	Revenue.	Revenue for year.
Entire Year 1916.....	500	$20.00	$10,005	.....
Half Year 1916.....	1,200	6.80	8,150	$18,155
Entire Year 1917.....	1,700	15.40	26,305	.....
Half Year 1917.....	625	6.80	4,120	$30,425
Entire Year 1918.....	2,325	14.80	34,545	.....
Half Year 1918.....	375	6.55	2,450	$36,995
Entire Year 1919.....	2,700	14.60	39,446	.....
Half Year 1919.....	250	6.45	1,555	$41,000
Entire Year 1920.....	2,950	14.45	42,555	.....
Half Year 1920.....	150	6.30	945	$43,500

Operating Expenses of Comparative Plant:

The operating expenses of the existing plant were $63.20 per million gallons pumped in 1914. (Depreciation and fixed charges excluded) and it is estimated that these expenses will be decreased so as to become $57.50 for the year 1920. For the comparative plant the cost of operation will not be materially higher during the early years of operation on account of the rapidity with which con-
792 sumers connect their services to the mains, necessitating a comparatively large pumpage.

The average rate of domestic revenue received for all water pumped in 1914 was $116.00 per million gallons. This has been estimated to decrease to $100 per million gallons pumped in 1920. With a knowledge of the income and operating statistics of the present plant, I have estimated the income and operating costs of the comparative plant as shown in Table No. 4.

TABLE No. 4.

Annual Operating Expenses of Comparative Plant.

(Going Plant Pumpage Estimated to be 435 M. G. in 1920.)

Year ending Dec. 31.	Estimated domestic revenue.	Income per M. G. pumped.	M. G. pumped annually.	Operating cost per M. G.	Annual operating expense.
1916.....	$18,155	$72.40	250	$63.25	$15,800
1917.....	30,425	86.80	350	60.00	21,000
1918.....	36,995	96.10	385	59.00	22,700
1919.....	41,000	99.25	414	58.00	24,000
1920.....	43,500	100.00	435	57.50	25,000

From the data in Tables No. 3 and No. 4, a summarized table of operations of the comparative plant has been made. These data are shown in Table No. 5. No allowance has been made in this table for income from unemployed capital.

793 TABLE No. 5.

Annual Income and Expense of Comparative Plant.

Year ending Dec. 31.	Gross income.	Operation, maintenance, and taxes.	Net income excl. of depreciation and fixed charges.	Depreciation.	Net income applicable to fixed charges & dividends.
1915.....	0	0	0	0	0
1916.....	$21,415	$15,800	$5,615	$5,250	$365
1917.....	33,745	21,000	12,745	5,350	7,395
1918.....	40,375	22,700	17,675	5,450	12,225
1919.....	44,340	24,000	20,340	5,550	14,790
1920.....	47,000	25,000	22,000	5,650	16,350

Income on Unemployed Capital:

In Table No. 6 is shown the computation relating to the income on unemployed capital. It must be remembered that in this method of computing going value, the appraiser should consider himself at the parting of the ways, with an amount of capital in hand sufficient to buy the existing plant (covering in the cost thereof the physical plant, lost interest during construction and going value) and follow through the steps relating to the investment in the comparative plant which a capitalist would take, and the return he would get in the form of interest on his unemployed capital.

It is assumed that he could place idle funds at a 4% rate, except as to the funds required for the year's construction on which the bank rate of interest is assumed to be 2%. It is further assume-
794 that on money expended during the year, the bank would allow him six months' interest at 2%, corresponding to a 2% rate on average bank balance throughout the year.

The comparative physical plant has a value of $503,817, and the lost interest during construction amounts to $15,114, so that the total investment, including the loss of interest, is $518,931. The going value being unknown, must be determined by a series of approximate computations. Only the final adjustment is shown in these tables.

The plant is assumed to have a going value of $16,328. On this assumption the total value (or cost to the investor) of the existing plant is as follows:

Physical Plant	$503,817
Lost Interest during Construction	15,114
Going Value	16,328
Total Value	$535,259

Therefore, the investor who has concluded to build a new hypothetical plant, instead of to purchase the old plant, is assumed to have in hand the sum of $535,259 as of January 1, 1915. He is further assumed to adopt the same order of construction for the new comparative plant as shown in Table "A", Item No. 56. Under these assumptions Tables Nos. 6 and 7 result.

TABLE No. 6.

Final Computation of Net Annual Income (from Operation and from Interest on Unemployed Capital of Comparative Plant.

Assumed Capital in Hands of the Investor-Builder on January 1, 1915.

Value of Physical Plant	$503,817
Interest during Construction (Table 3)	15,114
Assumed Going Value	16,328
Total	$535,259

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
		Determination of interest on unemployed capital of comparative plant.									
Year ending Dec. 31.	Net income from operation. See col. 6, Table 5.	Total investment to date in comp. (phys.) plant & interest during constr.	Going value.	Total assumed investment to date, col. 3 + col. 4.	Amount invested which is earning 4%.	Amount withdrawn for construction during year.*	One year's interest on— Col. 6 @ 4%.	One year's interest on— Half of col. 7 @ 2%.	Total interest, col. 8 + col. 9.	Lost interest during constr.	Total annual income or return on comp. plant, col. 2 + col. 10 & 11.
1915.....	0	$518,931	0	$518,931	$16,328	$518,931	$653	$5,189	$5,842	$15,114	$20,956
1916.....	$365	518,931	—$6,260	512,671	22,588	—6,260	904	—63	841	15,114	1,206
1917.....	7,396	518,931	6,293	525,224	10,035	12,553	401	126	527	15,114	7,922
1918.....	12,225	518,931	12,714	531,645	3,614	6,421	145	64	209	15,114	12,434
1919.....	14,790	518,931	15,404	534,335	924	2,690	37	27	64	15,114	14,854
1920.....	16,350	518,931	16,328	535,259	0	924	0	0	0	15,114	16,350

*To cover physical plant, interest during construction, and going value.

796

TABLE No. 7.

Final Going Value Computation as of January 1st, 1915.

1.	2.	3.	4.	5.	6.	7.	8.
	Total net return.			Present worth of excess earning of existing over comparative plant.			
Year ending Dec. 31st.	Existing plant.	Comparative plant.	Excess of existing plant.	Period of years.	Factor at 6%.	Amounts.	Cumulative amounts.
1915	$15,050	$20,956	—$5,906	1	1.06	—$6,260	—$6,260
1916	15,310	1,206	14,104	2	.889996	12,553	6,293
1917	15,570	7,922	7,648	3	.839619	6,421	12,714
1918	15,830	12,434	3,396	4	.792094	2,690	15,404
1919	16,090	14,854	1,236	5	.747258	924	16,328
1920	16,350	16,350	0	6	.704961	0	16,328
Resulting Going Value	$16,328						
Assumed Going Value	16,328						
Error on Final Computation	0						

797 The going value ($16,328) estimated in this item is based upon the assumption that the present rate of return will prevail throughout the going value development period, that is, to January 1st, 1920. This rate of return after allowing 1% per annum for depreciation is *is* 2.7% upon the value found herein, which is far too low to attract capital into an investment of this character.

As a matter of interest and further information, I have estimated the going value based upon a fair rate of return of 7% upon the value found herein (after allowing 1% per annum for depreciation) and find the amount under this assumption to be $59,940.

Item No. 58. Operating Capital.

This includes such cash on hand as may be necessary to conduct the business of this company, and which cannot be withdrawn or used for other purposes. The amount allowed for this item is approximately three months' general operating expense, $5,000.00.

798 APPENDIX.

(Here follow diagrams marked pages 798*a*, 799, 800, and 801.)

Bluefield Water Works & Improvement Co., Bluefield, W. Va.

Year ending Dec. 31st.	1909.	1910.	1911.	1912.	1913.	1914.
Gross Income	$25,361.66	$31,483.48	$35,727.99	$33,766.52	$36,031.91	$39,801.88
Fixture Rates	8,540.71	9,326.72	10,973.13	12,013.37	7,889.32	8,167.08
Meter Services	15,463.95	20,656.76	23,179.86	20,103.15	26,492.59	28,492.30
Public Hydrants	1,357.50	1,500.00	1,575.00	1,650.00	1,650.00	3,142.50
Total Income	$25,361.66	$31,483.48	$35,727.99	$33,766.52	$36,031.91	$39,801.88
Total cost excl. taxes, dep. and fixed charges	9,175.67	15,153.42	13,474.49	15,086.21	12,819.87	17,524.78
Add Taxes	2,369.03	1,994.15	2,085.23	2,069.18	2,202.53	2,448.57
Total cost excl. deprec. and fixed charges	11,544.70	17,147.57	15,559.82	17,155.39	15,022.40	19,973.35
Add Depreciation	6,859.99	6,617.84	6,243.00	4,317.29	8,141.42	4,557.87
Total cost excl. fix. chgs	18,404.69	23,765.41	21,802.82	21,472.68	23,163.82	24,531.22
Add Fixed Charges	4,091.17	3,944.55	4,515.10	3,434.53	7,841.39	6,060.02
Total Cost of Oper., Maint., Taxes, Deprec. and Fixed Charges	22,495.86	27,709.96	26,317.92	24,907.21	31,005.21	30,591.24

802½ *Preliminary Estimates for Water Supply, Bluefield, West Va., as Bearing on the Value of Water from the Springs of the Bluefield Water Works & Improvement Co.*

February, 1916.

John W. Alvord and Chas. B. Burdick,

Hydraulic and Sanitary Engineers,

Hartford Building,

Chicago.

Sanders & Crockett.

803 *Preliminary Estimates for Water Supply, Bluefield, West Va., as Bearing on the Value of Water from the Springs of the Bluefield Water Works & Improvement Co.*

In order to throw some light on the value of the springs owned by the Bluefield Water Works and Improvement Company, it is desirable to determine whether or not these springs have a special value as a source of supply in addition to the value of the real estate and the cost of development.

That portion of the value of the springs which is due to the land value and development can be readily estimated in the usual way, but the determination of special value, if there is any, resulting from their ability to furnish water at a lower cost than any other source, requires special consideration and analysis.

The questions then to be answered in connection with these springs are:

First. Have the springs any special value above the land value and cost of development?

Second. If they have a special value, how to determine the amount and its distribution?

804 Have the Springs a Special Value?

In order to properly answer this question, it is desirable to know the cost of water delivered at the twin tanks from the cheapest available source of supply, other than the present supply. This cost in each case is made up of interest on first cost, depreciation, and operating expense. If the cost of water under the cheapest other available supply is greater than the comparable cost from the present source of supply, then it must be true that the springs now owned and operated by the Bluefield Water Works & Improvement Company must have some special value above that of the land and development cost. It also follows that if water can be obtained from a new source

at a less cost than from the present source, the springs have no special value, and are worth perhaps even less than the value of the land and cost of development.

In order to determine the cheapest source of supply other than the present source, I have estimated the cost per million gallons of an equivalent amount of water, delivered to the twin tanks, from the three most known practicable sources, namely, the Bluestone River, Mud Fork, and Brushy Fork. The Bluestone supply involves the impounding of water by a storage dam above Graham, a distance of four miles from the tanks and at an elevation approximately 400 feet below the tanks. The Mud and Brushy Fork supplies each require a storage dam near Falls Mills, distance of five and four and a quarter miles, respectively, from the tanks. In each case the plant would necessarily include filtration works to make
805 the character of the water comparable with the existing supply, involving an investment cost and operating cost that are not incurred in the present plant.

Of the three above sources of supply, the Bluestone River supply is found upon examination to be the most desirable and economical, inasmuch as it is less expensive than either the Mud Fork or Brushy Fork sources, and being supported by a larger watershed, requires less storage. Its drainage area is 17 square miles, largely from East River mountain, while those of the Mud Fork and Brushy Fork are 14 and 11 square miles, respectively. Mud Fork is, I am informed, already preempted in large part by the N. & W. Ry.

It is assumed that the average yield of a watershed in this locality may be developed to as much as 500,000 gallons per square mile per day with a sufficient storage and impounding reservoir. Ample supply is therefore available at this site.

In the following table is shown preliminary estimates on the investment costs of the three above described new available sources of supply, followed by a comparison of cost per million gallons of water at the twin tanks between the cheapest of these three sources and the present supply.

806	Bluestone River.	Mud fork.	Brushy fork.
16" Pipe @ $2.50 per lin. ft. complete, including laying, rock excavation, valves, etc.....	$52,640	$65,900	$56,000
2 Pumps, 1½ Mil. Gals. each..	15,000	15,000	15,000
Boilers, 300 H. P. including piping and fittings.....	6,000	6,000	6,000
All piping and auxiliaries in station	5,500	5,500	5,500
Stack	3,300	3,300	3,300
Underground piping	3,750	3,750	3,750
Station Building and Improvements	16,000	16,000	16,000
Filtration Plant, 2 M. G. Cap., complete	30,000	30,000	30,000
Land, 75 acres @ $200.00.....	15,000	15,000	15,000
Dam	65,000	65,000	65,000
Eng. Franchises, Preliminary Cost, etc. @ 15%	31,950	33,800	32,350
Investment cost total plant	$244,140	$259,250	$247,900

Since the investment cost on the Bluestone supply is less than either of the other two, and also since the head to be pumped against is less than either Mud Fork or Brushy Fork, it is at once seen that the cost of pumping, investment charge, and annual depreciation, and size of drainage area, all point in favor of the Bluestone River as the best and cheapest source of supply for comparison with the present supply. Since this is true, we can neglect the Mud Fork and Brushy Fork projects from further consideration, and deal only with the Bluestone project.

807 Cost of Spring Supply.

The cost of the present source of supply has been estimated in the detailed estimates of the Report on the Value of the Entire Plant, and is here summarized, as follows:

Real Estate and Easements.....	$33,964
Water Supply Development, Pipe Lines, etc.....	115,140
Pumping Stations	59,988
Engineering, Preliminary Costs, etc. @ 15%.....	31,500
Total investment cost.....	$240,592

It is also necessary, in connection with the cost of each source of supply, to estimate the depreciation, the cost of pumping for the present plant, and cost of pumping and filtration for the new plant. An outline of these estimates is as follows:

Cost of Pumping and Filtration—New Plant at Bluestone River.

Assumed station duty = 40,000,000 ft. lbs. per 1,000 lbs. of dry steam.
Average daily pumpage, 870,000 gallons.
Foot lbs. daily = 870,000 x 8.3 x 425 = 3,100,000,000.

$$1{,}000 \times \frac{3{,}100{,}000{,}000}{40{,}000{,}000} = 77{,}500 \text{ lbs. of dry steam daily.}$$

5 lbs. of water evaporated per lb. of coal.

$$\frac{77{,}500}{5} = 15{,}500 \text{ lbs. coal} = 7.75 \text{ tons per day @ } \$1.75.$$

775 x 365 x $1.75 = $4,950 annual coal charge.
808 Filtration estimated at $2.00 per M. G. for pumping.
" " 4.00 " " " filtering.
$6.00 " "

.87 x $6 x 365 = $1,970 annual cost of filtration.
$4,950 + $1,970 = $6,290 total annual cost of pumping and filtration—new plant at Bluestone River.

Cost of Pumping—Present Plant, Ada.

Assumed station duty = 40,000,000 ft. lbs. per 1,000 lbs. of dry steam.
Average daily pumpage 430,000 gallons.
Foot lbs. daily = 430,000 x 8.3 x 575 = 2,050,000,000.

$$1{,}000 \times \frac{2{,}050{,}000{,}000}{40{,}000{,}000} = 51{,}250 \text{ lbs. of dry steam daily.}$$

5 lbs. of water evaporated per lb. of coal.

$$\frac{51{,}250}{5} = 10{,}250 \text{ lbs. coal} = 5.125 \text{ tons per day @ } \$1.75.$$

5.125 x $1.75 x 365 = $3,280.00 total annual cost of coal at present plant at Ada.

The following comparison shows the cost of water per million gallons delivered at the twin tanks as between the Bluestone supply and the present source:

809 Bluestone Supply:

6% interest on investment cost of $244,140	$14,648
Annual depreciation	1,260
Pumping and filtration	6,920
Total annual cost	$22,825

$$\text{Cost per M. G.} \frac{\$22,828}{.87 \times 365} = \$71.75.$$

Present Supply:

6% on investment cost of $240,592	$14,435
Annual depreciation	1,170
Pumping	3,280
Total annual cost	$18,885

$$\text{Cost per M. G.} \frac{\$18,885}{.87 \times 365} = \$59.30.$$

We have now shown that the cost of water per million gallons delivered at the twin tanks is less expensive from the present source of supply than from the next cheapest available source, and, therefore, we must conclude that the springs owned and operated by the Bluefield Water Works and Improvement Company have some special value in excess of the value of the land and the cost of spring development.

810 What is the Amount of the Special Value and How is it to be Distributed Among the Various Groups of Springs.

Since water from the present source of supply costs $71.75—$59.30 = $12.45 per M. G. less than from the proposed Bluestone River supply, the annual saving resulting is equal to the annual pumpage multiplied by the saving per million gallons. Thus, .87 x 365 x $12.45 = $3,960 annual saving.

The total life of the springs has been somewhat conservatively estimated at 50 years; that is, it is thought that their useful life to this plant will extend approximately 40 years in the future. If we should assume that the springs will have no value at the end of 40 years, it is reasonable to suppose that the savings gained by their operation will diminish uniformly from $3,960 to 0 over the period, and in this case the total value of these springs at the present time is indicated by the present worth of their annual savings up to the time that they become an uneconomical source of supply in operation, or fail to deliver a sufficient quantity in dry weather to make them valuable.

The following table shows the determination of the present worth

of the annual saving throughout the life of the springs, the column showing savings diminishing uniformly throughout the 40 year period:

811

Years of operation.	Annual saving.	Present worth factor @ 5%.	Present worth.
1	$3,960	1.0	$3,960
2	3,861	.9524	3,680
3	3,762	.9070	3,410
4	3,663	.8638	3,170
5	3,564	.8227	2,940
6	3,465	.7835	2,720
7	3,366	.7462	2,510
8	3,267	.7107	2,340
9	3,168	.6768	2,140
10	3,069	.6446	1,980
11	2,970	.6139	1,820
12	2,871	.5847	1,680
13	2,775	.5568	1,540
14	2,673	.5303	1,420
15	2,574	.5051	1,300
16	2,475	.4810	1,190
17	2,376	.4581	1,088
18	2,277	.4363	995
19	2,178	.4155	910
20	2,079	.3957	828
21	1,980	.3769	748
22	1,881	.3589	677
23	1,782	.3418	610
24	1,683	.3256	550
25	1,584	.3101	482
26	1,485	.2953	440
27	1,386	.2812	390
28	1,287	.2678	345
29	1,188	.2551	304
30	1,089	.2429	255
31	990	.2314	229
32	891	.2204	196
33	792	.2099	166
34	693	.1999	139
35	596	.1904	113
36	495	.1813	90
37	396	.1727	68
38	297	.1644	49
39	198	.1566	33
40	99	.1491	15
Total savings			$47,520

812 In the above manner it is shown that the least value that lies in the water which flows from all the springs is, in round numbers, about $50,000.

Since the supply come from two groups of springs, one of which flows by gravity (the Gravity Group) into the tanks and the other (the Ada Group) requires pumping against a considerable head, it is obvious that the Gravity Group is the more valuable.

It is, therefore, next necessary to estimate the cost of water delivered at the tanks from each group of springs. This has been done in the following tables:

Investment cost.	Gravity group.	Ada group.
Real Estate and Easements	$5,485.	$13,175.
Spring development	14,645.	19,368.
Pipe lines	22,467.	58,660.
Pumping stations	.....	59,988.
Total	$42,597.	$151,191.
6% on investment	$2,556.	$9,071.
Annual depreciation	235.	937.
Cost of pumping	456.	3,280.
	$3,256.	$13,288.

$$\text{Cost per M. G.} = \frac{\$3,256}{.44 \times 365} = 20.30$$

$$\text{“ “ “} = \frac{\$13,288}{.43 \times 365} = \$84.70$$

813 We thus find that the Gravity group of springs is worth $\frac{84.70}{105.00}$ of the total value of $50,000 = $40,400, or in round numbers, $40,000, and the Ada group is worth about $10,000 each in excess of its land and development cost.

As a final step in this economic analysis, we should, if possible, distribute the value of all the springs in each group so as to find the value that should be given to each spring. Aside from the purity of the water, the value of any one spring must necessarily be dependent upon three important factors, namely, the amount of its flow, its distance from the tanks, and its elevation. A large yield and a high elevation tend to make a spring more valuable, while the greater its distance from the tanks the smaller necessarily must be its value, owing to the greater investment necessary to develop it for use.

The levels of all the springs have been given us from surveys made under the direction of Mr. McCarthy, the Superintendent, and

the flows of the springs at dry season of 1915 were carefully measured by Mr. A. T. Luce in his work of preparing the inventory for Alvord & Burdick. The general map gives opportunity for determining the distance development from the town tank. With this data, therefore, we can make a general apportionment which will be approximately correct for each spring.

The following table shows the manner in which the value per group of springs is apportioned between all the springs in each group, the value of each gravity spring being determined by the amount of its flow, its distance from the tanks, and its elevation, and the value of each Ada spring, and Beaver Pond spring by the amount of its flow and its distance from the tanks, the ques-
814 tion of elevation being neglected since all the Ada supply is pumped the same height.

Extra Value of Springs, Based on Elevation, Location, and Flow, Over and Above Land and Development Cost.

	Spring No.	Lift above 2,280'.	Est. min. flow, G. P. M.	Est. max. flow, G. P. M.	Av. flow, G. P. M.	1,000' pipe chargeable to spring.	Elev. x flow ÷ pipe chargeable.	% of total value.	Value per group.	Value per spring.
	1	486	19.4	54.8	42.6	.4	51.8	25.5	.....	$10,200
	2	530	12.5	35.4	27.5	.5	28.7	14.2	.....	5,680
	3	561	10.7	30.3	23.5	1.2	11.0	5.4	.....	2,160
	4*a*	524	6.8	19.2	15.0	.7	11.3	5.6	.....	2,240
	4*b*	524	12.5	35.4	27.5	.7	20.6	10.2	.....	4,080
	5	648	37.0	100.4	81.2	1.5	35.1	17.4	.....	6,960
Gravity	6*a*	534	34.8	98.0	76.5	1.1	37.2	18.4	.....	7,360
Group.	6*b*	534	3.6	10.2	7.9	1.1	3.8	1.9	$40,000	760
	7*a*	539	.2	.5	.4	.8	.3	.15	.....	60
	7*b*	539	.2	.6	.5	.8	.3	.15	.....	60
	7*c*	539	.2	.5	.4	.8	.3	.15	.....	60
	9	578	2.5	7.0	5.5	2.7	1.2	.6	.....	240
	10	563	.9	2.5	2.0	3.0	.4	.2	.....	80
	11	583	.7	2.0	1.5	3.2	.3	.15	.....	60
	12	...	3.6	...	2.6	1.27	2.1	.76	.....	76
	13	...	5.3	...	3.8	1.27	3.0	1.09	.....	109
	14	...	9.7	...	6.9	1.27	3.8	1.38	.....	138
	15	Flows into Ada Spring #21.								
	16	...	5.8	...	4.2	7.5	.6	.22	.....	22
	17	...	19.2	...	13.7	7.8	1.7	.62	.....	62
Ada	18*a*	...	.9	...	.7	5.7	.12	.04	$10,000	4
Group	18*b*	...	25.4	...	18.2	5.7	3.2	1.16	.....	116
	19	...	98.0	...	215.0	Undeveloped.				
	20	Abandoned.								
	21	...	350.0	...	250.0	1.27	197.0	71.56	.....	7,156
Beaver	22	0	.....	...	140.0	3.1	Polluted.			
Pond.	23	163	175.0	...	525.0	8.25	63.8	23.17	.....	2,317

815 As a result of this analysis of the conditions that influence the value of the water rights in the springs of the Bluefield Water Works & Improvement Company, I conclude that this value is conservatively placed at not less than $50,000, and that of this amount about $40,000 is the special value of the Gravity group of springs, and about $10,000 the special value of the Ada group of springs, including Beaver Pond spring.

Respectfully submitted,

JOHN W. ALVORD.

815a *Investigation and Report on the Past Cost of the Water Works Plant of the Bluefield Water Works and Improvement Company.*

January 1, 1916.

Compiled under the Direction of

John W. Alvord,

Hydraulic & Sanitary Engineer,

Chicago,

by

E. E. Smith,

Assistant Engineer.

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816 *Letter of Transmittal and Summary of Investigation.*

Mr. J. M. Wirgman, Pres.,
Bluefield Water Works & Improvement Co.,
Philadelphia, Pa.

DEAR SIR:

In accordance with your request we have made a detailed study of the past cost of the water works plant and property of the Bluefield Water Works & Improvement Company.

This work has necessitated a very careful and detailed study of the past financial history, and the records of the Company. It has been done under our general direction by Mr. E. E. Smith, an ex-

perienced and capable assistant of our office. A general description of the methods pursued, difficulties encountered and reasoning followed, will be found from place to place in the body of the report.

The basis of our work is an analysis of all items of receipt and expenditure, detailed and summarized year by year. Following this is given a copy, year by year, of the balance sheets of the Bluefield Water Works & Improvement Company, giving a summary of all business done by them, for purposes of comparison. As a result of this study, we find in summarizing the work, that:

817

1st. The amount of strictly cash outlay expended for the construction of the plant from its inception to January 1, 1916, is..... $415,704.00

2nd. The Past Cost of the plant and property with deficits computed by the Wisconsin Commission method (cost plus deficits), allowing 6% return and 1% depreciation is..... $471,494.00

3rd. The Past Cost and deficits computed by Wisconsin Commission method, allowing 7% return and 1% depreciation is..... $548,412.00

4th. The Past Cost and deficits computed by the Wisconsin method, allowing 7½% return and 1% depreciation is..... $592,416.00

5th. The Past Cost and deficits computed by Wisconsin method, allowing 8% return and 1% depreciation is..... $640,550.00

With these tables as a guide other tables at different rates of return can be computed as desired.

In pursuance with summation suggested for determining the cumulative investment cost as in the Richmond, Indiana case,

818 we find:

6th. The cumulative investment cost, adding all deficits year by year under a 6% return is..... $549,223.00

7th. The cumulative investment cost, adding all deficits year by year under a 7% return is..... $642,354.00

8th. The cumulative investment cost, adding all deficits year by year under a 7½% return is..... $695,735.00

9th. The cumulative investment cost, adding all deficits year by year under an 8% return is..... $754,345.00

Other tables can be computed at different rates of return as desired.

Our determination of the itemized year by year costs has not been accomplished without some difficulties which required engineering experience and construction knowledge to overcome. Our reasoning

in every case where the recorded evidence is not clear is set forth as plainly as possible herein.

We have endeavored to avoid any theories or personal conclusions in the main investigation of past records save those forced upon us by certain obscurities in the record, and the final summation of Past Cost plus deficits is made along lines heretofore suggested by
819 Utility Commissions. Not knowing the rate of fair return yet to be fixed by the Commission, we have necessarily computed the summation upon several different rates of return.

In Appendix "A" will be found a discussion by Mr. Alvord on the uses of Past Cost in arriving at Present Value, which is prepared with the more general interest in the principles involved in view, and may, it is hoped, prove helpful.

In concluding our work we wish to acknowledge our appreciation of the consideration and patience that has been shown us by the officers of your Company, to whom we are indebted for much information and assistance.

Respectfully submitted,

ALVORD & BURDICK.
JOHN W. ALVORD.

E. E. SMITH,
Asst. Engineer.

Chicago, Illinois,
November 21st, 1916.

819*a* THE REPORT.

819*b* *Report on Past Cost of Bluefield Water Works Properties.*

Theory of Investigation.

In the determination of the Past Cost of a property, two general sources may be examined. First, actual ascertainment of the expenditures found properly recorded, as obtained from the books and records of the Company, and second, an estimate of cost based upon a year by year inventory of the physical property, applying thereon unit prices such as prevailed at the time of installation. Where full and accurate records are available the first method is of course the one to be followed as the best evidence. Owing at times to the incompleteness of the records, it is sometimes necessary to accept for such gaps as may occur the latter method and sometimes necessary in places to employ a union of both methods. Unquestionably, the most accurate results are obtained from a summation of actual expenditures, and were the records fully complete and self-explanatory, the investigation would be simply accountants' work. Where, as is usually the case, gaps, omissions and incomplete description occur in the records the knowledge of the engineer is necessary to interpret what otherwise might be blind and misleading information.
820 Even where the information of the record is fairly complete the engineer familiar with the construction and operation of works of a similar character can verify and check the record

in many ways which would not occur to an accountant. In the case of Bluefield, the memoranda at hand for the purpose of making a complete list and proper assignment of all expenditures during the whole life of the Water Works plant is somewhat confused, owing to the fact that the Company originally was organized to do three lines of business at Bluefield, namely, Land, Houses, and Water Works. On January 1st, 1908, the Land and House accounts were separated from the Water Works account and for the year previous we have complete vouchers, therefore from January 1st, 1907 to the present time, it is not a difficult task to list expenditures that properly apply to the Water Works business. Fortunately the larger part of the expenditures (53%) for the Water Works property were made in this later period.

Actual Past Cost.

Those items which go to make up an actual Past Cost Record, consist of all expenditures made in good faith toward the building of the original plant or additions thereto and all expenditures
821 made in good faith to keep the plant in proper running order, so that the highest efficiency may be always had from it. Expenditures may either be in the form of cash, stock, or services rendered gratuitously by the owners. It is seen then that where all the actual expenditures are known, the burden of the investigation lies in correctly determining what expenditures are for building, as apart from those made in connection with the operation and maintenance of the property. The proper determination of such classification must result from such description as accompanies the record of the amount of money spent, supplemented at times by a working knowledge of what various supplies and materials would be for. Sometimes in the records the only description given is that a certain sum of money was paid a certain person, no further details of the transaction being given. It is necessary then to know the kind of business the payee is engaged in or what kind of work is usually performed for the company by this particular person or corporation to whom the money was paid. There is thus, the additional burden of proof to determine the nature of various transactions. After all the transactions and expenditures made are known, it is quite a simple conclusion to decide upon those expenditures made for construction, but it is more difficult to always determine with certainty between the upkeep cost or main-
822 tenance and the cost of pure operation. In the latter division in fact, it is impossible to draw a hard and fast rule to follow in each case, yet in order that our methods may be clearly understood for the classification of expenses, we will outline briefly certain rules which we have adopted to govern our distribution.

Any expenditure made after the installation of the structure or appurtenance is complete, made in an effort to keep the machine or pipe or structure in proper working order and yet not materially improving it above its original condition, may be said without doubt to be a mantenance expense and such it is easily understood to be. Just where the cost of operating ends and cost of maintenance be-

gins is ordinarily a rather indefinite division; for instance, in connection with the work on a pump, the expenses incurred by having a man watch it and keep it cleaned and oiled are evidently operation, while the cost of repairing the pump by reason of any break that may occur to its parts, is obviously maintenance, but there are a variety of charges between these more simply determined items such as the cost of packing and its installation, which are on the border line that divides the cost of maintenance from the cost of operation. There are also other short lived repairs to machinery and building such as painting, plastering, paperhanging, fire brick, gaskets,
823 test gages, etc., and there are expenditures for contingent depreciation, such as insurance, damage done because of small accidents and further there are costs such as those arising from the bringing of suits against people who have been committing nuisances and thereby endangering the water supply, which are in the general category of maintenance costs.

Generally speaking, operation costs have in this investigation been taken as those resulting from the purchase of supplies and labor to make the plant work properly and as well, of course, the cost of the collection of revenue, keeping of records, bookkeeping and financial matters. Maintenance costs have been confined to pure upkeep; small or large renewals, where distinctly indicated by the evidence as found.

Frequently the records which describe expenditures made are not full enough for intelligent classification and at times they are lacking altogether and it is necessary, in order to fill up approximately such gaps in the record, to learn the amount and character of the work that has been put in place during these intervals when the records of cost are missing and by studying similar work in the same vicinity, during the same period, apply unit cost of labor and materials to the obvious quantities found in the existing structure. Expenditures for maintenance and operation during such a period of no record
824 may be obtained fairly closely from a study of similar expenditures prior to and following the period of incomplete record.

The Bluefield Records.

Generally speaking, the records of the Bluefield Water Works and Improvement Company as a single enterprise are fairly complete. But in making a separate past cost analysis of only the water works property of the Company we have been confronted by the difficulty that no such separation had originally been thought necessary or desirable, and therefore, no division of the general expense, such as office expense, legal expense, taxes, sundry bills, etc., was made during the early years of the company's development.

The records available now in the company's possession are the bookkeeper's account books from the inception of the plant up to the present time, which, however, have to do entirely with the water works business since January 1st, 1908. From January 1st, 1907, up to the present time there are available vouchers showing records

of expenditures, separated as between plant and expense accounts, and in the minute books of the Company from its beginning are shown annual balance sheets for the entire life of the plant. These balance sheets have been very helpful in arriving at the amount of stock, bonds, interest, dividends, etc., which are believed to be applicable to the water works part of the business for any particular year.

825 Deficits in Return.

Whenever there are deficits in the fair return in the early years or throughout the life of the property it is usual to assume in determining the past cost of a property that these deficits are a part of the cost.

The determination of deficits may be estimated in two ways, first, as suggested by the Wisconsin Commission, in which the deficits below the assumed fair rate of return for each year are added into the capital account at the end of that year and carried forward to the next year, as a part of the cost of the property, and, second, on an investment basis as suggested by Judge Duncan on the hearing of the Richmond case by the Indiana Utility Commission. This latter way of considering them consists of summing up the amounts of money that have been put into the business by the owner and the amounts that have been drawn out by him in the shape of interest or dividends year by year, assuming for each year a fair return rate, and considering the return rate as a part of the money that was put back into the business. This method makes the cost of the property cumulative.

826 Before computations can be made upon either of the above methods, it is necessary to determine as accurately as possible those factors that enter into the computations. These are shown in the following table in connection with which it is to be noted that the general expense, dividends, bond interest and interest on loans and stock are, for the earlier years of the plant history, necessarily pro rated. That is to say, for instance, the amount of bonds taken as applicable to the water works property, are taken in the proportion of the capital invested in water works property to the total capital invested, which is indicated by annual balance sheets shown in the minute book of the Company. After 1907, when the land and house business was separated from the water business it was unnecessary to make any such assumptions on a pro rata basis, for since that time the records are conclusive evidence of the bonds and other amounts that have gone into the business, and of the amounts that have been withdrawn.

While it cannot be claimed that the above pro rata basis is strictly accurate, under the circumstances it is the best solution that can be suggested and it is believed that the capital invested in the various kinds of business, as shown by the balance sheets in the minute book, is a rational basis for making the division of stocks, bonds, etc., that apply to those branches of the business or solely to the water

works business. It is felt, therefore, that the results shown in
827 the following table are approximately correct and reasonable.

The interpretation of the accounts and records of the Bluefield Water Works and Improvement Company, for the period prior to January 1st, 1908, was not accomplished without some difficulties, which required engineering experience as well as a knowledge of construction, in order to classify expenditures. We have endeavored to set out clearly all these expenditures, as well as the division of income, in the yearly details that form a part of this report.

Each yearly statement includes a brief history as to the more important developments throughout the year, and also gives in as much detail as is possible the expenditures for the year, separated as between plant account, income and operation, and also a resumé of the interest and dividends for the year.

The actual plant expenditures are quite clearly defined by the recorded accounts and vouchers extending throughout the life of the plant.

Up to and including 1901 the water works plant expenditures are shown by the cash book and ledger accounts in a manner that leaves no doubt as to their being properly recorded. From 1902 to
828 1906 inclusive owing to the transfer of the books to the Philadelphia office and a change in the method of bookkeeping, the plant expenditures are not so clearly defined. Very few of the plant costs show in detail in the cash book, but are condensed or summarized and carried in the ledger account, from which the data for this report was taken, practically as it stands. In the years following 1906 the Company has complete vouchers for all expenditures at Bluefield, and these were used as the basis for data inasmuch as a study of them discloses details that could not be obtained from the books. During this period, however, the books were used to such a degree as was necessary in establishing a general check on the vouchers. In but few instances have expenditures shown as an operating expense on the Company's record been considered as a plant charge.

In general, the total plant cost of $415,704 on January 1, 1916, check quite closely with the book value of that date (which is approximately $320,000), when it is considered that approximately $80,000 has been charged off for depreciation, and that all such items of cost, such as tools, materials, supplies, utility equipment, and office furniture and fixtures have not been considered by the Company as a part of the plant, but have been carried in separate accounts.

829 The income for each year up until 1908 has been taken from the Revenue and Expense account on the books of the Company practically as it shows in the following annual statements, except where an item of income has been offset by an item of expense relating to the same transaction.

Perhaps more difficulty was experienced in the separation of the water works expense accounts between the upkeep cost or maintenance and the cost of pure operation. Up until 1902, as heretofore stated in connection with the discussion on plant account, the

Year.	Plant account. For year.	Plant account. Total.	Income.	Operation.	Pro rata general expense.	Total cost of operation.	Maintenance.	Total outlay for operation & maintenance.	Net return applicable to depr., bond int., & dividends.	Pro rata bond interest & interest on loans.	Pro rata dividends.	Total withdrawn for bond interest & dividends.	Pro rata stock applicable to water works.
1890	$27,815	$27,815	$3,331	$152	$470	$622	$29	$651	$2,680	$0	$855	$855	$35,000
1891	11,161	38,976	7,684	213	515	728	0	728	6,956	0	3,690	3,690	1,700
1892	26,486	65,462	9,818	701	1,070	1,771	74	1,845	7,973	755	3,360	4,115	19,800
1893	2,141	67,603	11,124	2,222	975	3,197	296	3,493	7,631	1,120	525	1,645	—4,000
1894	922	68,525	8,619	2,166	975	3,141	104	3,245	5,374	1,310	525	1,835	0
1895	4,361	72,886	7,169	3,498	1,355	4,853	101	4,954	2,215	1,195	0	1,195	1,700
1896	187	73,073	9,866	4,383	1,200	5,583	106	5,689	4,177	1,210	0	1,210	1,000
1897	1,326	74,399	9,375	3,105	1,460	4,565	47	4,612	4,763	1,625	0	1,625	800
1898	1,593	75,992	10,627	3,123	1,185	4,308	156	4,464	6,163	1,630	0	1,630	1,000
1899	3,415	79,407	10,504	3,617	945	4,562	225	4,787	5,717	1,670	0	1,670	1,000
1900	17,910	97,317	10,340	3,695	1,770	5,465	216	5,681	4,659	1,935	0	1,935	10,000
1901	28,049	125,366	13,787	5,104	2,520	7,624	311	7,935	5,852	2,693	0	2,693	18,500
1902	3,988	129,354	15,644	6,372	1,810	8,182	123	8,305	7,339	2,812	0	2,812	2,500
1903	8,100	137,454	20,048	11,999	1,880	13,879	666	14,545	5,503	2,480	0	2,480	4,000
1904	11,764	149,218	19,183	12,019	1,945	13,964	0	13,964	5,219	2,200	0	2,200	—1,500
1905	5,803	155,021	19,105	8,619	735	9,354	2,225	11,579	7,526	2,180	0	2,180	17,000
1906	39,194	194,215	23,307	7,722	1,075	8,797	4,030	12,827	10,480	1,185	0	1,185	50,500
1907	76,499	270,714	30,936	11,221	1,200	12,421	4,962	17,383	13,553	760	0	760	19,000
1908	29,015	299,729	25,839	10,529	1,333	11,862	1,952	13,814	12,025	135	10,080	10,215	74,000
1909	11,576	311,305	25,362	11,096	1,333	12,429	2,084	14,513	10,849	1,125	0	1,125	0
1910	8,272	319,577	31,528	12,034	1,500	13,534	5,258	18,792	12,736	1,215	7,560	8,775	0
1911	11,193	330,770	35,778	14,325	1,500	15,825	2,675	18,500	17,278	1,280	10,080	11,360	0
1912	37,040	367,810	33,822	11,418	1,500	12,918	3,312	16,230	17,592	1,215	5,040	6,255	0
1913	16,796	384,606	36,092	12,320	3,596	15,916	3,411	19,327	16,765	3,050	0	3,050	60,000
1914	14,831	399,437	39,857	15,590	5,200	20,790	5,380	26,170	13,687	0	0	0	0
1915	16,267	415,704	42,895	17,792	5,200	22,992	4,700	27,692	15,203	0	0	0	0

expenditures are set forth in the cash book and ledger in sufficient detail so that with some little study the separation could be made without material inaccuracies. While the expense accounts for the years from 1902 to 1906 inclusive are not shown in as great detail as in the previous years, it is believed that there can be no serious error in the separation as shown in the annual statements for these years.

In connection with the voucher record of expenditures from 1906 to the present time, all expenditures aside from plant costs are listed as M. & R. (maintenance and repair) charges, and include all materials and supplies that go into operating costs. However, each M. & R. item is explained as to its application, such as

830 M. & R. (Mains).
M. & R. (Springs).
M. & R. (Pumping).
M. & R. (Coal).

etc., so that the separation is not a difficult matter. The payroll vouchers show the distribution of labor in such a manner that but little study is necessary to determine whether it belongs to operation or maintenance.

As heretofore stated the business of the Company, as far as the general overhead costs, bonds, interest, dividends and stock are concerned, is carried upon the books as a single enterprise. Inasmuch as each of the above have had to do, and are therefore, applicable in some degree to the three kinds of business in which the Company has been engaged, namely, land, houses, and water works, it is necessary to decide as to the best method of arriving at the proportion that should be applied to the water works division of the business.

The minute book of the Company contains for each year a balance sheet, copies of which are included herein, and which have been used in determining the method of separating the general overhead expense and financial transactions, as between the various lines of business, thus arriving at the amounts to be applied to the water works only.

831 The balance sheets show the capital invested in land, houses, and water works at the end of each year, and the items of general overhead expense and financial transaction applicable to water works have been pro rated as previously explained. As heretofore stated it is believed that the results obtained by such a pro rata basis are approximately correct and reasonable.

(Here follows table marked page 832.)

833 Wisconsin Method.

The past cost of the plant and business of the water works property of the Bluefield Water Works & Improvement Company has been computed by the Wisconsin Commission Method, as shown in the four tables immediately following. It has been found that, computed in this way, the present cost of the property is:

1st.	Allowing 6% return and 1% for depreciation.....	$471,494
2nd.	Allowing 7% return and 1% for depreciation.....	548,412
3rd.	Allowing 7½% return and 1% for depreciation....	592,416
4th.	Allowing 8% return and 1% for depreciation.....	640,550

Based on 6% Return + 1% Depreciation.

1. Year.	2. Earning value.	3. Additions during year.	4 Depreciation @ 1%.	5 Interest at 6%.	6 Total col. 4 + col. 5.	7 Net earnings from operation.	8 Deficits col. 6 — col. 7.	9 Value at end of year, col. 2 + col. 3 + col. 8.
*1890	$17,882	$9,933	$120	$715	$835	$2,680	—$1,845	$25,970
1891	25,970	11,161	200	1,558	1,818	6,956	—5,138	31,993
1892	31,993	26,486	320	1,920	2,240	7,973	—5,733	52,746
1893	52,746	2,141	527	3,165	3,692	7,631	—3,939	50,948
1894	50,948	922	509	3,057	3,566	5,374	—1,808	50,062
1895	50,062	4,361	501	3,004	3,505	2,215	+1,290	55,713
1896	55,713	187	557	3,343	3,900	4,177	—277	55,623
1897	55,623	1,326	556	3,337	3,893	4,763	—870	56,079
1898	56,079	1,593	561	3,365	3,926	6,163	—2,237	55,435
1899	55,435	3,415	554	3,326	3,880	5,717	—1,837	57,013
1900	57,013	17,910	570	3,421	3,991	4,659	—668	74,255
1901	74,255	28,049	743	4,455	5,198	5,852	—654	101,650
1902	101,650	3,988	1,017	6,099	7,116	7,339	—223	105,415
1903	105,415	8,100	1,054	6,325	7,379	5,503	+1,876	115,391
1904	115,391	11,764	1,154	6,923	8,077	5,219	+2,858	130,013
1905	130,013	5,806	1,300	7,801	9,101	7,526	+1,575	137,391
1906	137,391	39,194	1,374	8,243	9,617	10,480	—863	175,722
1907	175,722	76,499	1,757	10,543	12,300	13,553	—1,253	250,968
1908	250,968	29,015	2,510	15,058	17,568	12,025	+5,543	285,526
1909	285,526	11,576	2,855	17,132	19,987	10,849	+9,138	306,240
1910	306,240	8,272	3,062	18,374	21,436	12,736	+8,700	323,212
1911	323,212	11,193	3,232	19,393	22,625	17,278	+5,347	339,752
1912	339,752	37,040	3,398	20,385	23,783	17,592	+6,191	382,983
1913	382,983	16,796	3,830	22,979	26,809	16,765	+10,044	409,823
1914	409,823	14,831	4,098	24,589	28,687	13,687	+15,000	439,654
1915	439,654	16,267	4,397	26,379	30,776	15,203	+15,573	471,494

*Taken on ⅔ of year.

835 *Analysis of Past Cost and Earnings of the Water Works Properties of the Bluefield Water Works & Improvement Company.*

Based on 7% Return + 1% Depreciation.

1. Year.	2. Earning value.	3. Additions during year.	4 Depreciation @ 1%.	5 Interest at 7%.	6 Total col. 4 + col. 5.	7 Net earnings from operation.	8 Deficits col. 6 — col. 7.	9 Value at end of year, col. 2 + col. 3 + col. 8.
*1890	$17,882	$9,933	$120	$834	$954	$2,680	—$1,726	$26,089
1891	26,089	11,161	261	1,826	2,087	6,956	—4,869	32,381
1892	32,381	26,486	324	2,267	2,591	7,973	—5,382	53,485
1893	53,485	2,141	535	3,744	4,279	7,631	—3,352	52,274
1894	52,274	922	523	3,659	4,182	5,374	—1,192	52,004
1895	52,004	4,361	520	3,640	4,160	2,215	+1,945	58,310
1896	58,310	187	583	4,082	4,665	4,177	+488	58,985
1897	58,985	1,326	590	4,129	4,719	4,763	—44	60,267
1898	60,267	1,593	603	4,219	4,822	6,163	—1,341	60,519
1899	60,519	3,415	605	4,236	4,841	5,717	—876	63,058
1900	63,058	17,910	631	4,414	5,045	4,659	+386	81,354
1901	81,354	28,049	814	5,695	6,509	5,852	+657	110,060
1902	110,060	3,988	1,101	7,704	8,805	7,339	+1,466	115,514
1903	115,514	8,100	1,155	8,086	9,241	5,503	+3,738	127,352
1904	127,352	11,764	1,274	8,915	10,189	5,219	+4,970	144,086
1905	144,086	5,803	1,441	10,086	11,527	7,526	+4,001	153,890
1906	153,890	39,194	1,539	10,772	12,311	10,480	+1,831	194,915
1907	194,915	76,499	1,949	13,644	15,593	13,553	+2,040	273,454
1908	273,454	29,015	2,735	19,142	21,877	12,025	9,852	312,321
1909	312,321	11,576	3,123	21,862	24,985	10,849	14,136	338,033
1910	338,033	8,272	3,380	23,662	27,042	12,736	14,306	360,611
1911	360,611	11,193	3,606	25,243	28,849	17,278	11,571	383,375
1912	383,375	37,040	3,834	26,836	30,670	17,592	13,078	433,493
1913	433,493	16,796	4,335	30,345	34,680	16,765	17,915	468,204
1914	468,204	14,831	4,682	32,774	37,456	13,687	23,769	506,804
1915	506,804	16,267	5,068	35,476	40,544	15,203	25,341	548,412

*Taken on ⅔ of year.

836 *Analysis of Past Cost and Earnings of the Water Works Properties of the Bluefield Water Works & Improvement Company.*

Based on 7½% Return + 1% Depreciation.

Based on 7½% Return + 1% Depreciation.

1. Year.	2. Earning value.	3. Additions during year.	4 Depreciation @ 1%.	5 Interest @ 7½%.	6 Total col. 4 + col. 5.	7 Net earnings from operation.	8 Deficits col. 6 — col. 7.	9 Value at end of year, col. 2 + col. 3 + col. 8.
*1890	$17,882	$9,933	$120	$893	$1,013	$2,680	—$1,667	$26,148
1891	26,148	11,161	261	1,961	2,222	6,956	—4,734	32,575
1892	32,575	26,486	326	2,443	2,769	7,973	—5,204	53,857
1893	53,857	2,141	539	4,039	4,578	7,631	—3,053	52,945
1894	52,945	922	529	3,971	4,500	5,374	—874	52,993
1895	52,945	4,361	530	3,974	4,504	2,215	+2,289	59,643
1896	59,643	187	596	4,473	5,069	4,177	+892	60,722
1897	60,722	1,326	607	4,554	5,161	4,763	+398	62,446
1898	62,446	1,593	624	4,683	5,307	6,163	—856	63,183
1899	63,183	3,415	632	4,739	5,371	5,717	—346	66,252
1900	66,252	17,910	663	4,969	5,632	4,659	+973	85,135
1901	85,135	28,049	851	6,385	7,236	5,852	+1,384	114,568
1902	114,568	3,988	1,146	8,593	9,739	7,339	+2,400	120,956
1903	120,956	8,100	1,210	9,072	10,282	5,503	+4,779	133,835
1904	133,835	11,764	1,338	10,038	11,376	5,219	+6,157	151,756
1905	151,756	5,803	1,518	11,382	12,900	7,526	+5,374	162,933
1906	162,933	39,194	1,629	12,220	13,849	10,480	+3,369	205,496
1907	205,496	76,499	2,055	15,412	17,467	13,553	+3,914	285,909
1908	285,909	29,015	2,859	21,443	24,302	12,025	+12,277	327,201
1909	327,201	11,576	3,272	24,540	27,812	10,849	16,963	355,740
1910	355,740	8,272	3,557	26,681	30,238	12,736	17,502	381,514
1911	381,514	11,193	3,815	28,614	32,429	17,278	15,151	407,858
1912	407,858	37,040	4,079	30,589	34,668	17,592	17,076	461,974
1913	461,974	16,796	4,620	34,648	39,268	16,765	22,503	501,273
1914	501,273	14,831	5,013	37,595	42,608	13,687	28,921	545,025
1915	545,025	16,267	5,450	40,877	46,327	15,203	31,124	592,416

*Taken for ⅔ of year.

Based on 8% Return + 1% Depreciation.

1. Year.	2. Earning value.	3. Additions during year.	4 Depreciation @ 1%.	5 Interest @ 8%.	6 Total col. 4 + col. 5.	7 Net earnings from operation.	8 Deficits col. 6 — col. 7.	9 Value at end of year, col. 2 + col. 3 + col. 8.
*1890	$17,882	$9,993	$120	$953	$1,073	$2,680	—$1,607	$26,208
1891	26,208	11,161	262	2,097	2,359	6,956	—4,597	32,772
1892	32,772	26,486	328	2,622	2,950	7,973	—5,023	54,235
1893	54,235	2,141	542	4,339	4,861	7,631	—2,770	53,606
1894	53,606	922	536	4,288	4,824	5,374	— 550	53,978
1895	53,978	4,361	540	4,318	4,858	2,215	+2,643	60,982
1896	60,982	187	610	4,879	5,489	4,177	+1,312	62,481
1897	62,481	1,326	625	4,998	5,623	4,763	+860	64,667
1898	64,667	1,593	647	5,173	5,820	6,163	—343	65,917
1899	65,917	3,415	659	5,273	5,932	5,717	+215	69,547
1900	69,547	17,910	695	5,564	6,259	4,659	+1,600	89,057
1901	89,057	28,049	891	7,125	8,016	5,852	+2,164	119,270
1902	119,270	3,988	1,193	9,542	10,735	7,339	+3,396	126,654
1903	126,654	8,100	1,267	10,132	11,399	5,503	+5,896	140,650
1904	140,650	11,764	1,406	11,252	12,658	5,219	+7,439	159,853
1905	159,853	5,803	1,599	12,788	14,387	7,526	+6,861	172,517
1906	172,517	39,194	1,725	13,801	15,526	10,480	+5,046	216,757
1907	216,757	76,490	2,168	17,341	19,509	13,553	+5,956	299,212
1908	299,212	29,015	2,992	23,937	26,929	12,025	14,904	343,131
1909	343,131	11,576	3,431	27,450	30,881	10,845	20,032	374,739
1910	374,739	8,272	3,747	29,979	33,726	12,736	20,990	404,001
1911	404,001	11,193	4,040	32,320	36,360	17,278	19,082	434,276
1912	434,276	37,040	4,343	34,742	39,085	17,592	21,493	492,809
1913	492,809	16,796	4,928	39,425	44,353	16,765	27,588	537,193
1914	537,193	14,831	5,372	42,975	48,347	13,687	34,660	586,684
1915	586,684	16,267	5,867	46,935	52,802	15,203	37,599	640,550

*Taken for ⅔ of year.

838 The past cost of the Water Works Properties of the Bluefield Water Works & Improvement Company may also be taken on a cumulative investment basis, that is to say, from the point of view of what the investor actually puts in and what he has actually taken out in view of some fixed rate of return. This involves only a study as to the amounts that have been put into the business, and as to the amounts that have been withdrawn, assuming that the property in use was entitled to some specified fair rate of return on the investment. This return was either paid out as dividends or interest on funded debt, and the remainder, if any, reinvested in the property. The only additional investment in the property would be made by cash raised from bond issues or capital stock issues. Four computations of the cumulative investment cost of the Water Works Properties of the Bluefield Water Works & Improvement Company, the returns being taken at 6%, 7%, 7½% and 8% respectively have been made. Under this method no depreciation is allowed as it has been up to date largely met from within the property itself. The following tabulations illustrate the method and show the results. On the basis of a 6% return the present cumulative cost is $549,320,

On 7% basis it is $637,873
On 7½% " " " 695,731
On 8% " " " 754,345.

839 *Table Showing Investment Result in the Water Works Properties of the Bluefield Water Works and Improvement Company at 6%.*

Year.	Interest @ 6%.	Amounts withdrawn. Dividends.	Bond interest.	Interest on loans.	Total.	Left in.	Debt. Bonds sold.	Loans from stockholders.	Stock.	Capital account Dec. 31st.
*1890	$1,400	$855	0	0	$855	$545	0	0	$35,000	$35,545
1891	2,133	3,690	0	0	3,690	—1,557	0	0	1,700	35,688
1892	2,141	3,360	$755	0	4,115	—1,974	$10,790	0	19,800	64,304
1893	3,858	525	1,120	0	1,645	2,213	5,210	0	—4,000	67,727
1894	4,064	525	1,310	0	1,835	2,229	2,715	0	0	72,671
1895	4,360	0	1,195	0	1,195	3,165	—1,650	0	1,700	75,886
1896	4,553	0	1,210	0	1,210	3,343	215	0	1,000	80,444
1897	4,827	0	1,625	0	1,625	3,202	5,925	0	800	90,371
1898	5,422	0	1,630	0	1,630	3,792	70	0	1,000	95,233
1899	5,714	0	1,670	0	1,670	4,044	575	0	1,000	100,852
1900	6,051	0	1,935	0	1,935	4,116	3,780	0	10,000	118,748
1901	7,125	0	2,515	$178	2,693	4,432	8,280	$5,400	18,500	155,360
1902	9,322	0	2,550	262	2,812	6,510	580	1,400	2,500	166,350
1903	9,981	0	1,380	1,100	2,480	7,501	—36,400	13,970	4,000	155,331
1904	9,320	0	0	2,200	2,200	7,120	0	18,335	—1,500	179,286
1905	10,757	0	0	2,180	2,180	8,577	0	—335	17,000	204,528
1906	12,272	0	0	1,185	1,185	11,087	0	—16,500	50,500	249,525
1907	14,971	0	0	760	760	14,211	0	—22,180	19,000	260,556
1908	15,633	10,080	0	135	10,215	5,418	0	19,110	74,000	359,084
1909	21,545	0	0	1,125	1,125	20,420	0	—1,800	0	377,704
1910	22,662	7,560	0	1,215	8,775	13,887	0	—3,220	0	388,371
1911	23,302	10,080	0	1,280	11,360	11,942	0	+11,800	0	412,113
1912	24,727	5,040	0	1,215	6,255	18,472	0	+22,120	0	452,705
1913	27,162	0	0	3,050	3,050	24,112	0	+9,870	60,000	488,807
						.....	.....	—57,880	.....	.....
1914	29,328	0	0	0	0	29,328	0	0	0	518,135
1915	31,088	0	0	0	0	31,088	0	0	0	549,223

*Taken on ⅔ of Year.

840 *Table Showing Investment Result in the Water Works Properties of the Bluefield Water Works and Improvement Company at 7%.*

Year.	Interest @ 7%.	Amounts withdrawn.				Left in.	Debt.		Stock.	Capital account Dec. 31st.
		Dividends.	Bond interest.	Interest on loans.	Total.		Bonds sold.	Loans from stockholders.		
1890	$1,632	$855	0	0	$855	$777	0	0	$35,000	$35,777
1891	2,504	3,690	0	0	3,690	—1,186	0	0	1,700	36,291
1892	2,540	3,360	$755	0	4,115	—1,575	$10,790	0	19,800	65,306
1893	4,571	525	1,120	0	1,645	2,926	5,210	0	—4,000	69,442
1894	4,861	525	1,310	0	1,835	3,026	2,715	0	0	75,183
1895	5,263	0	1,195	0	1,195	4,068	—1,650	0	1,700	79,301
1896	5,551	0	1,210	0	1,210	4,341	215	0	1,000	84,857
1897	5,940	0	1,625	0	1,625	4,315	5,925	0	800	95,897
1898	6,713	0	1,630	0	1,630	5,083	70	0	1,000	102,050
1899	7,144	0	1,670	0	1,670	5,474	575	0	1,000	109,099
1900	7,637	0	1,935	0	1,935	5,702	3,780	0	10,000	128,581
1901	9,001	0	2,515	$178	2,693	6,308	8,280	$5,400	18,500	167,069
1902	11,695	0	2,550	262	2,812	8,883	580	1,400	2,500	180,432
1903	12,630	0	1,380	1,100	2,480	10,150	—36,490	13,970	4,000	172,062
1904	12,044	0	0	2,200	2,200	9,844	0	18,335	—1,500	198,741
1905	13,912	0	0	2,180	2,180	11,732	0	—335	17,000	227,138
1906	15,900	0	0	1,185	1,185	14,715	0	—16,590	50,500	275,763
1907	19,303	0	0	760	760	18,543	0	—22,180	19,000	291,126
1908	20,379	10,080	0	135	10,215	10,164	0	19,110	74,000	394,400
1909	27,608	0	0	1,125	1,125	26,483	0	—1,800	0	419,083
1910	29,336	7,560	0	1,215	8,775	20,561	0	—3,220	0	436,424
1911	30,550	10,080	0	1,280	11,360	19,190	0	+11,800	0	467,414
1912	32,718	5,040	0	1,215	6,255	26,463	0	+22,120	0	515,997
1913	36,120	0	0	3,050	3,050	33,070	0	+9,870	60,000	561,057
						.....	.....	—57,880	.....	.....
1914	39,274	0	0	0	0	39,274	0	0	0	600,331
1915	42,023	0	0	0	0	42,023	0	0	0	642,354

841 *Table Showing Investment Result in the Water Works Properties of the Bluefield Water Works and Improvement Company at 7½%.*

Year.	Interest @ 7½%.	Amounts withdrawn.				Left in.	Debt.		Stock.	Capital account Dec. 31st.
		Dividends.	Bond interest.	Interest on loans.	Total.		Bonds sold.	Loans from stockholders.		
1890	$1,748	$855	0	0	$855	$893	0	0	$35,000	$35,893
1891	2,692	3,690	0	0	3,690	—998	0	0	1,700	36,595
1892	2,744	3,360	$755	0	4,115	1,371	$10,790	0	19,800	65,814
1893	4,936	525	1,120	0	1,645	3,291	5,210	0	—4,000	70,315
1894	5,273	525	1,310	0	1,835	3,438	2,715	0	0	76,468
1895	5,735	0	1,195	0	1,195	4,540	—1,650	0	1,700	81,058
1896	6,079	0	1,210	0	1,210	4,869	215	0	1,000	87,142
1897	6,535	0	1,625	0	1,625	4,910	5,925	0	800	98,777
1898	7,408	0	1,630	0	1,630	5,778	70	0	1,000	105,625
1899	7,922	0	1,670	0	1,670	6,252	575	0	1,000	113,452
1900	8,509	0	1,935	0	1,935	6,574	3,780	0	10,000	133,806
1901	10,035	0	2,515	178	2,693	7,342	8,280	$5,400	18,500	173,328
1902	12,999	0	2,550	262	2,812	10,187	580	1,400	2,500	187,995
1903	14,099	0	1,380	1,100	2,480	11,619	—36,490	13,970	4,000	181,094
1904	13,582	0	0	2,200	2,200	11,382	0	18,335	—1,500	209,311
1905	15,698	0	0	2,180	2,180	13,518	0	—335	17,000	239,494
1906	17,902	0	0	1,185	1,185	16,777	0	—16,590	50,500	290,181
1907	21,763	0	0	760	760	21,002	0	—22,180	19,000	308,004
1908	23,100	10,080	0	135	10,215	12,885	0	19,110	74,000	413,999
1909	31,050	0	0	1,125	1,125	29,925	0	—1,800	0	442,124
1910	33,159	7,560	0	1,215	8,775	24,384	0	—3,220	0	463,288
1911	34,746	10,080	0	1,280	11,360	23,386	0	+11,800	0	498,474
1912	37,385	5,040	0	1,215	6,255	31,130	0	+22,120	0	551,724
1913	41,379	0	0	3,050	3,050	38,329	0	+9,870	60,000	602,043
						.....	.....	—57,880	.....	.....
1914	45,153	0	0	0	0	45,153	0	0	0	647,196
1915	48,539	0	0	0	0	48,539	0	0	0	695,735

Year.	Interest @ 8%.	Amounts withdrawn.				Left in.	Debt.		Stock.	Capital account Dec. 31st.
		Dividends.	Bond interest.	Interest on loans.	Total.		Bonds sold.	Loans from stockholders.		
1890	$1,865	$855	0	0	$855	$1,010	0	0	$35,000	$36,010
1891	2,881	3,690	0	0	3,690	—809	0	0	1,700	36,901
1892	2,952	3,360	$755	0	4,115	—1,163	$10,799	0	19,800	66,328
1893	5,306	525	1,120	0	1,645	3,661	5,210	0	—4,000	71,199
1894	5,696	525	1,310	0	1,835	3,861	2,715	0	0	77,775
1895	6,222	0	1,195	0	1,195	5,027	—1,650	0	1,700	82,852
1896	6,628	0	1,210	0	1,210	5,418	215	0	1,000	89,485
1897	7,159	0	1,625	0	1,625	5,534	5,925	0	800	101,744
1898	8,140	0	1,630	0	1,630	6,510	70	0	1,000	109,324
1899	8,746	0	1,670	0	1,670	7,076	575	0	1,000	117,975
1900	9,438	0	1,935	0	1,935	7,503	3,780	0	10,000	139,258
1901	11,141	0	2,515	$178	2,693	8,448	8,280	$5,400	18,500	179,886
1902	14,391	0	2,550	262	2,812	11,579	580	1,400	2,500	195,945
1903	15,675	0	1,380	1,100	2,480	13,195	—36,490	13,970	4,000	190,620
1904	15,250	0	0	2,200	2,200	13,050	0	18,335	—1,500	220,505
1905	17,640	0	0	2,180	2,180	15,460	0	—335	17,000	252,630
1906	20,210	0	0	1,185	1,185	19,025	0	—16,590	50,500	305,565
1907	24,445	0	0	760	760	23,685	0	—22,180	19,000	326,070
1908	26,086	10,080	0	135	10,215	15,871	0	19,110	74,000	435,051
1909	34,804	0	0	1,125	1,125	33,679	0	—1,800	0	466,930
1910	37,354	7,560	0	1,215	8,775	28,579	0	—3,220	0	492,289
1911	39,383	10,080	0	1,280	11,360	28,023	0	+11,800	0	532,112
1912	42,569	5,040	0	1,215	6,255	36,314	0	+22,120	0	590,546
1913	47,244	0	0	3,050	3,050	44,194	0	+9,870	60,000	646,730
						.....	.....	—57,880	.....	.....
1914	51,738	0	0	0	0	51,738	0	0	0	698,468
1915	55,877	0	0	0	0	55,877	0	0	0	754,345